PRELIMINARY ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES AT FORT BENJAMIN HARRISON, LAWRENCE TOWNSHIP, INDIANA

Prepared for:

U.S. ARMY

ODCS, G-9, ISE BRAC

Final
August 2023

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LIST OF ACRONYMS AND ABBREVIATIONS

AAFES	Army and Air Force Exchange System
AFFF	Aqueous Film-Forming Foam
AOPI	Area of Potential Interest
Army	U.S. Army
AST	Aboveground Storage Tank
ATSDR	Agency for Toxic Substances and Disease Registry
BRAC	Base Realignment and Closure
bgs	Below Ground Surface
btoc	Below Top of Casing
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CFR	Code of Federal Regulations
COI	Constituent of Interest
CSM	Conceptual Site Model
DERP	Defense Environmental Restoration Program
DIS	Directorate of Installation Support
DNR	Department of Natural Resources
DOA	Department of the Army
DoD	U.S. Department of Defense
DPCA	Directorate of Personnel and Community Activities
DRMO	Defense Reutilization Marketing Office
ECOS	Environmental Conservation Online System
EDR	Environmental Data Resources, Inc.
EI	Environmental Investigation
EIS	Environmental Impact Statement
ERA	Ecological Risk Assessment
FBH	Fort Benjamin Harrison
FFS	Focused Feasibility Study
FHRA	Fort Harrison Reuse Authority
FTA	Fire Training Area
GSA	General Services Administration
HFPO-DA	Hexafluoropropylene Oxide Dimer Acid (aka GenX)
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
IDEM	Indiana Department of Environmental Management
IPaC	Information for Planning and Consultation
IWC	Indianapolis Water Company
LHA	Lifetime Health Advisory
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No Further Action
NGVD	National Geodetic Vertical Datum of 1992
NOSC	Navy Operation Support Center
NPDES	National Pollutant Discharge Elimination System
OSD	Office of the Secretary of Defense
OWS	Oil/Water Separator
P.E.	Professional Engineer
P.G.	Professional Geologist
PA	Preliminary Assessment
PAL	Project Action Limit

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

PCB	Polychlorinated Biphenyl
PFAS	Per- and Polyfluoroalkyl Substances
PFBS	Perfluorobutane Sulfonate
PFHpA	Perfluoroheptanoic Acid
PFHxS	Perfluorohexane Sulfonate
PFNA	Perfluorononanoic Acid
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PMP	Project Management Professional
POL	Petroleum, Oil, and Lubricants
POW	Prisoner of War
ppb	Parts per Billion
ppt	Parts per Trillion
PX	Post Exchange
QA	Quality Assurance
RCRA	Resource Conservation and Recovery Act
REM	Registered Environmental Manager
RfD	Reference Dose
RI	Remedial Investigation
RSL	Regional Screening Level
SDWA	Safe Drinking Water Act
SI	Site Inspection
STP	Sewage Treatment Plant
SVOC	Semivolatile Organic Compound
SWMU	Solid Waste Management Unit
T&E	Threatened and Endangered
TASO	Training Aids Service Office
TPH	Total Petroleum Hydrocarbon
TRADOC	Training and Doctrine Command
U.S.C.	United States Code
UCMR3	Third Unregulated Contaminant Monitoring Rule
UCMR5	Fifth Unregulated Contaminant Monitoring Rule
USACE	U.S. Army Corps of Engineers
USASSC	U.S. Army Soldier Support Center
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WFPA	Well Field Protection Area
WWI	World War I
WWII	World War II
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

The objective of a Preliminary Assessment (PA) is to identify areas of potential interest (AOPIs) based on whether use, storage, or disposal of potential per- and polyfluoroalkyl substances (PFAS)-containing materials, including aqueous film-forming foam (AFFF), occurred in accordance with the 2018 *Army Guidance for Addressing Releases of Per- and Polyfluoroalkyl Substances* (U.S. Army 2018). A PA for PFAS-containing materials, with a focus on perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorobutane sulfonate (PFBS), perfluorononanoic acid (PFNA), perfluorohexane sulfonate (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA) and its ammonium salt ("GenX" chemicals), was completed for the Base Realignment and Closure (BRAC) property at Fort Ben Harrison (FBH), to assess potential PFAS release areas and exposure pathways. The entire former FBH property, which is in Lawrence Township, Indiana, was selected for closure under BRAC. The completion of this PA included the execution of the following tasks:

- Conducted a kickoff meeting with the BRAC Office and the U.S. Army Corps of Engineers (USACE) on May 27, 2021, to present all parties' preliminary knowledge of the former FBH to provide information to guide the PA and site visit.
- Reviewed available records (e.g., aerial photography, historical maps, technical reports, previous studies, investigations) from online sources (i.e., Internet-based searches), environmental investigations and/or regulatory programs (e.g., the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA]), and internal U.S. Army (Army) documents from the Administrative Record. In addition, an Environmental Data Resources, Inc. (EDR) Report was generated for the former FBH and included any listed sites within and up to a 2-mile search distance.
- Conducted a 2-day site visit on August 5 and 6, 2021, to identify potential sources of PFAS and gather information for developing conceptual site models (CSMs) at AOPIs.
- Interviewed individuals with historical and present-day knowledge of operations on the BRAC property.
- Identified AOPIs and developed preliminary CSMs for pathways of potential PFAS in soil, groundwater, surface water, and sediment.

In conducting the PA of the BRAC property at the former FBH, six AOPIs were identified where a potential for release of PFAS exists resulting from site operational history. AOPIs were identified at potential PFAS-release locations on the BRAC property only.

Based on the potential PFAS releases at the AOPIs, the potential for exposure to PFAS contamination in soil exists. In addition, the potential for off-post exposure in groundwater exists, as on-post groundwater could influence downgradient drinking water sources. Given the findings of this PA, the AOPIs presented warrant further evaluation in a Site Inspection (SI)

1. INTRODUCTION

The U.S. Army (Army) conducted this Preliminary Assessment (PA) to investigate the potential presence of per-and polyfluoroalkyl substances (PFAS) at the former Fort Benjamin Harrison (FBH) in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 United States Code [U.S.C.] §9601 et seq.); the Defense Environmental Restoration Program (DERP, 10 U.S.C. §2701 et seq.); the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 CFR Part 300); and guidance documents developed by the U.S. Environmental Protection Agency (USEPA) and the Department of the Army. FBH is not on the National Priorities List, and the Army is responsible for compliance with CERCLA in accordance with Executive Order 12580, as amended.

The purpose of this PFAS PA is to identify locations that are areas of potential interest (AOPIs) on the former FBH based on the use, storage and/or disposal of potential PFAS-containing materials, in accordance with the 2018 *Army Guidance for Addressing Releases of Per-and Polyfluoroalkyl Substances* (U.S. Army 2018). The PA was conducted in general accordance with 40 CFR §300.420(b) and the USEPA *Guidance for Performing Preliminary Assessments Under CERCLA* (USEPA 1991) and the Army *Guidance for Addressing Releases of Per- and Polyfluoroalkyl Substances* (U.S. Army 2018). This report presents findings from research conducted to assess past use of materials containing PFAS and identify areas where these materials were stored, handled, used, or disposed of at FBH.

The entire former FBH property was evaluated, including Army-owned property as well as property that has been previously transferred, and will be herein referred to as FBH. FBH is located in Lawrence Township, Indiana, as shown in Figure 1-1.

1.1 PFAS BACKGROUND INFORMATION

PFAS are a group of synthetic compounds that have been manufactured and used extensively worldwide since the 1950s for a variety of purposes. PFAS are stable, man-made fluorinated organic chemicals that repel oil, grease, and water. Common industrial uses of PFAS include paints, varnishes, sealants, hydraulic fluid, surfactants, and firefighting foams. PFAS include both per- and polyfluorinated compounds. Perfluorinated compounds, such as perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexane sulfonate (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA or Gen X) are a subset of PFAS with completely fluorinated carbon chains, while polyfluorinated compounds have at least one carbon chain atom that is not fully fluorinated. These six PFAS together, and for the purposes of this PA, are referred to in this report as "Target PFAS."

FBH was evaluated for all potential use, storage, and/or disposal of PFAS-containing materials. A variety of PFAS-containing materials are used in relation to current and historical Army operations. However, the use, storage, and/or disposal of aqueous film-forming foam (AFFF) is the most common potential source of PFAS at U.S. Department of Defense (DoD) facilities. As such, this section is organized to summarize the AFFF-related sources first and all remaining potential PFAS-containing materials in the subsequent paragraph. AFFF is used as a firefighting agent to suppress petroleum hydrocarbon fires and vapors. Firefighting foams like AFFF were developed in the 1960s (ITRC 2020a), but AFFF did not see widespread DoD use until the early 1970s. Older fire training facilities often were unlined and not constructed to prevent infiltration of firefighting foams and combustion products leaching into the subsurface. Large quantities of AFFF may have been released into the environment as a result of fire training exercises, fire responses, fire suppression system activations, and tank and pipeline leaks/spills.

Other potential PFAS sources considered include installation storage warehouses, some pesticide use, automobile maintenance shops, photographic processing facilities, laundry/waterproofing facilities, car washes, stormwater or sanitary sewer components, and biosolid application areas.

Many PFAS are highly soluble in water and have low volatility due to their ionic nature. The specific gravity/relative density for PFOS and PFOA is 1.8 (ITRC 2020b). Long-chain perfluorinated compounds have low vapor pressure and are expected to persist in aquatic environments. These compounds do not readily degrade by most natural processes. They are thermally, chemically, and biologically stable, and are resistant to biodegradation, atmospheric photooxidation, direct photolysis, and hydrolysis. The structure of these compounds increases their resistance to degradation; the carbon-fluorine bond is one of the strongest in nature, and the fluorine atoms shield the carbon backbone.

When PFAS are released to the environment, they can readily migrate into soil, groundwater, surface water, and sediment. Once in the environment, PFAS are persistent and may continue to migrate through airborne transport, surface water, groundwater, and/or biologic uptake. The amount of PFAS entering the environment depends on the type and amount of the PFAS material that may have been released, where and when it was used, the type of soil, and other factors. If private or public wells are located nearby, they potentially could be affected by PFAS. Similarly, surface water features may be impacted and may convey PFAS to downgradient receptors.

Of the thousands of PFAS, some are considered precursor compounds (typically polyfluoroalkyl substances). Precursor compounds can abiotically or biotically transform into PFOS and PFOA. PFOS and PFOA are referred to as terminal PFAS, meaning no further degradation products will form from them (ITRC 2020c).

1.2 PURPOSE AND OBJECTIVES

The purpose of a PA under the NCP is to 1) eliminate from further consideration those sites that pose no threat to public health or the environment; 2) determine if there is any potential need for removal action; 3) set priorities for Site Inspections (SIs); and 4) gather existing data to facilitate evaluation for the release pursuant to the Hazard Ranking System, if warranted (40 CFR §300.420(b)(1)).

The primary objective of the PA is to identify locations at FBH where there was use, storage, or disposal of PFAS-containing materials resulting in a potential release of PFAS to the environment and conduct an initial assessment of possible migration pathways of potential contamination. This PA also includes development of a preliminary conceptual site model (CSM) for AOPIs related to PFAS.

1.3 PFAS REGULATORY OVERVIEW AND SCREENING CRITERIA

In May 2016, USEPA issued lifetime health advisories (LHAs) for PFOA and PFOS under the Safe Drinking Water Act (SDWA). To provide Americans, including the most sensitive populations, with a margin of protection from a lifetime of exposure to PFOS and PFOA in drinking water, USEPA established a health advisory level for PFOS and PFOA (individually or combined) of 70 ng/L (USEPA 2016).

In October 2019, the Office of the Secretary of Defense (OSD) issued guidance on investigation PFOS, PFOA, and PFBS at DoD restoration sites. The OSD guidance provided risk screening levels for PFOS, PFOA, and PFBS in (groundwater) tap water and soil, based on the USEPA regional screening level (RSL) calculator for residential and industrial reuse and using the oral reference dose of 2E-05 mg/kg-day. These screening levels are used during an SI to determine if further investigation in a Remedial Investigation (RI) is warranted.

In April 2021, USEPA issued an updated toxicity assessment for PFBS. USEPA developed chronic (0.0003 mg/kg-day) and subchronic (0.001 mg/kg-day) oral reference doses (RfDs) for PFBS as part of USEPA's toxicity assessment. The RSL for PFBS was previously calculated using the RfD of 0.02 mg/kg day. New toxicity values resulted in revisions to the RSLs for PFBS in May 2021 (USEPA 2021).

In September 2021, OSD issued a revision to *Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program* (DoD 2021). The revised memorandum accounts for the updated

PFBS screening levels attributable to USEPA's reassessment of PFBS toxicity in 2021. Based on USEPA's research, the RSLs for PFOS and PFOA are calculated using an RfD of 2E-05 mg/kg-day. The RSL for PFBS is calculated using an RfD of 3E-04 mg/kg-day. When multiple PFAS are encountered at a site, a 0.1 factor is applied to the screening level when it is based on noncarcinogenic endpoints.

In May 2022, based on continued evaluation of Target PFAS by the Agency for Toxic Substances and Disease Registry (ATSDR) and the USEPA Office of Water, USEPA provided new screening levels for PFOA, PFOS, PFNA, PFHxS, and HFPO-DA.

In July 2022, OSD issued a policy memorandum adopting these new screening levels to be used during the SI phase to determine whether further investigation in an RI is warranted. The screening levels for Target PFAS are listed in Table 1-1. This revised guidance is in effect as of July 2022 and is applicable to investigating PFOS, PFOA, PFBS, PFNA, PFHxS, and HFPO-DA at DoD restoration sites, including Base Realignment and Closure (BRAC) sites (DoD 2022). Currently, no legally enforceable Federal standards exist for PFAS in groundwater, surface water, soil, or sediment.

Table 1-1. Project Action Limits from the 2022 OSD Memorandum

Chemical	Residential Tap Water HQ = 0.1 (ng/L or ppt)	Residential Soil HQ = 0.1 (µg/kg or ppb)
HFPO-DA (GenX)	6	23
PFBS	601	1,900
PFHxS	39	130
PFNA	6	19
PFOA	6	19
PFOS	4	13

Note: The residential tap water PALs are used to evaluate groundwater and surface water data. The residential soil PALs are used to evaluate soil and sediment data.

The Army's strategy is to continue to assess and investigate potential releases and implement necessary response actions in accordance with CERCLA to ensure that no human health-based exposures are above the CERCLA risk-based values in drinking water. Therefore, sites where human exposure to contaminated drinking water exists will be addressed first and as quickly as possible to eliminate the exposure and then will be subsequently prioritized and sequenced to conduct the investigations and response actions necessary to characterize and, if necessary, remediate the source of PFAS contamination (U.S. Army 2018).

1.4 PA METHODOLOGY

The PA for FBH included a site visit, aerial photographic analysis, records review, and interviews that were conducted in accordance with the methods detailed in the Programmatic PA Work Plan (Leidos 2021). The Programmatic PA Work Plan outlines the approach and methodology for conducting the PFAS PA. As detailed in the Work Plan, the PA activities focused on ascertaining and documenting for following information regarding PFAS history and use, storage, or disposal at FBH:

- On-post fire training activities
- Use of PFAS-based AFFF in fire suppression systems or other systems
- AFFF stored, used, and/or disposed of at buildings and crash sites
- Activities or use of materials that are likely to contain PFAS, such as metal plating operations
- Wastewater treatment plants (WWTPs) and landfills that may have received PFAS-containing materials
- Studies conducted to assess environmental impacts at the facility
- Potential PFAS use at parcels post transfer
- Potential off post sources that may impact the Installation.

The data gathered during PA activities are summarized in Section 3.

1.5 REPORT ORGANIZATION

The contents of this PA Report are summarized below:

- ***Section 2. Site Background***—This section presents site-specific information related to site operational history and discusses the environmental setting. Demographics, land use, topography, geology, hydrogeology, hydrology, groundwater, potable wells, ecological receptors, and climate are described.
- ***Section 3. PA Analysis***—This section provides observations and results from the PA site visit, aerial photographic analysis, records review, and interviews.
- ***Section 4. Summary of PA Data***—This section provides an overview of the data collected during the PA for the different potential PFAS sources.
- ***Sections 5. Summary of PA Results***—This section synthesizes all of the data gathered from the PA activities and determines whether each area evaluated during the PA is an AOPI or was not retained as an AOPI.
- ***Section 6. Conclusions***—This section presents conclusions of the PA.
- ***Section 7. References—***This section lists the references that were used in the preparation of this report.
- ***Appendices***—Appendices A through G include data from field activities or related assessments:
  - Appendix A. Final Installation Kickoff Meeting Minutes
  - Appendix B. Documents/Sources Reviewed During PA
  - Appendix C. Aerial Photographs
  - Appendix D. Site Visit Photographs
  - Appendix E. Questionnaire Responses and Interview Notes
  - Appendix F. Records Review Documentation
  - Appendix G. Environmental Data Resources, Inc. (EDR) Report.

2. SITE BACKGROUND

2.1 SITE LOCATION

FBH is a former Army Installation located in Lawrence Township, Marion County, Indiana. While in operation, FBH consisted of 2,501 acres, which is located approximately 12 miles northeast of downtown Indianapolis (Figure 2-1).

2.2 SITE OPERATIONAL HISTORY

FBH was created by an act of the U.S. Congress in 1903. Initially established as an infantry regiment post, FBH became a World War I (WWI) training camp for officers and engineers. During the years between WWI and World War II (WWII), the Army used FBH as a training center for military personnel and civilians. From 1941 to 1945, the Installation became the site of an induction center for military draftees, home to several Army schools, a prisoner of war (POW) camp, an Army disciplinary barracks, and a 1,000-bed hospital. In 1947, FBH was officially declared "United States Army surplus." In October 1948, FBH was relinquished to the 10th Air Force for use as an air base; however, the facilities were inadequate for this type of use. In April 1950, command of FBH was returned to the Army and FBH was reactivated as the Army Finance Center. Gates-Lord Hall was completed in February 1957 to house the new Adjutant General and Finance Schools.

Activities that followed the opening of the Army Finance Center can be characterized as administration and training. In 1980, FBH was recognized and designated as the U.S. Army Soldier Support Center (USASSC), responsible for personnel service support, including finance, religion, legal aid, music, public affairs, morale, welfare, and recreation (U.S. Army 2020). Historical investigations at FBH have identified more than 100 buildings with historical and military significance (HLA 1993).

In 1991, FBH was placed on the DoD BRAC List that directed the closure of Fort Benjamin Harrison; the realignment of USASSC to Fort Jackson, South Carolina; and the retention of the DoD Finance and Accounting Service Indianapolis Center as a General Services Administration (GSA) stand-alone facility (Building 1) (U.S. Army 2020). Property disposal and reuse activities of 17 parcels were initiated following closure in October 1995 (U.S. Army 2020).

2.3 DEMOGRAPHICS, PROPERTY TRANSFER, AND LAND USE

While operational, FBH was bounded by residential areas and farmland to the north, northeast, and southwest, as well as light industrial areas that border the former Fort to the west and southeast. In 2019, the U.S. census reported a population of 125,195 for Lawrence Township (U.S. Census Bureau 2019).

Since closure in 1995, nearly 1,632 acres have been transferred to the State of Indiana for parks and a golf course, 73 acres associated with Building 1 has been transferred through GSA to the Defense Finance Accounting Service, and the majority of the remaining acreage has primarily been transferred to the Fort Harrison Reuse Authority (FHRA) for mixed use, including commercial and recreational uses. Land use for FBH and surrounding regional area is provided in Figure 2-2. A 138-acre parcel was retained by the Army (the FBH U.S. Army Reserve Enclave in the southeastern part of FBH), and a 60-acre landfill, undergoing post-closure certification, is anticipated for transfer to the Indiana Department of Natural Resources (DNR) (U.S. Army 2020). The current property transfer map is provided in Figure 2-3.

Following closure in 1995, FBH transferred Building 1 to the Defense Finance and Accounting Service through GSA. The State of Indiana received parcels for the 230-acre golf course in 1995, Eugene Burns Park in 2005, and Fort Harrison State Park (1,393 acres) in 2011. Nine conveyances of property were made to FHRA from 1996 to 2007, totaling 622 acres. The city of Lawrence received 3.3 acres in 1997. The city of Lawrence was the recipient of previous transfers prior to base closure, including the East Landfill in the 1970s. In 2022, 1.5 acres were conveyed to financial institutions.

The Lawrence Village Senior Residence (Army and Air Force Exchange Gas Station at Building 33) has an environmental restrictive covenant that was recorded in 2011 to ensure a sub-slab vapor mitigation system was installed during building construction and that groundwater use restrictions are in place due to the presence of metals and petroleum at the site.

2.4 TOPOGRAPHY

The landscape at FBH consists of moderately sloping terraces that rise from nearly level bottomland along Fall Creek and its tributaries to nearly level uplands. Fall Creek and its tributaries have eroded the landscape to form the sloping terraces and incised steep-walled ravines. Surface elevations across FBH range from 732 feet above National Geodetic Vertical Datum (NGVD) of 1992 along the northern boundary of FBH to 870 feet above NGVD of 1992 at the southern boundary (SAIC 1998). The surface topography at FBH is presented in Figure 2-1.

2.5 GEOLOGY

The surficial geology at FBH consists of recent and Pleistocene unconsolidated deposits that unconformably overlie Middle Devonian and Silurian limestone and dolomite bedrock units. The unconsolidated deposits are generally made up of two units: the Martinsville Formation (alluvium, silts, sands, and gravels) and the Trafalgar Formation (Kansan-, Illinoisan-, and Wisconsinian-age gaciofluvial and glacial till deposits). The till is generally a mixture of gravel, sand, and silt in a clayey matrix. The unconsolidated deposits reach their maximum thickness in bedrock valleys that were scoured during periods of glaciation and later filled with deposits from glacial meltwater. Bedrock valleys filled with remnant deposits of these glacial meltwater streams have been identified in the vicinity of FBH along Fall Creek (SAIC 1998). The unconsolidated till deposits at FBH are classified as three units (deep, middle, and shallow). The deep unit is assumed to be generally 100 to 150 feet thick. The middle and shallow units are found in the top 50 to 70 feet below ground surface (bgs) (USGS 1999).

The top of bedrock at FBH lies at approximately 150 to 250 feet bgs. Silurian-aged bedrock underlies the surficial deposits in the northwestern portion of FBH. These sedimentary rock units consist of white/gray limestone, tan dolomite, and blue shale, and exceed 150 feet in thickness. Devonian-aged bedrock, which lies beneath surficial deposits in the remainder of FBH, consists of white/blue limestone, tan dolomite, and blue/black shale. The regional dip of these two bedrock formations is to the southwest at approximately 0.27 degrees or 25 feet per mile.

The soil types found at FBH are grouped into three categories (bottomland, terrace, and upland) based on their physiographic location. Bottomland soil is found primarily in the northern portion of FBH along the floodplain of Fall Creek. The bottomland soil is a well-drained soil with medium- to coarse-grained texture, moderate permeability, and low runoff. Terrace soil is found primarily in the central portion of FBH on upland till plains, outwash plains, and terraces and are formed from glacial till and glacial outwash materials. The terrace soil is well-drained with moderately coarse-grained materials near the surface over moderately fine-grained material that changes abruptly to sand and gravel at 2 to 6 feet bgs. Upland soil, found near the southern and eastern boundaries of FBH, are poorly drained to well-drained soil types with moderately fine-grained surface and subsurface materials. Upland soil slopes are generally in the 0 to 2 percent range; however, some upland soil slopes exceed 25 percent. These steeper slopes have a high potential for erosion and place severe limitations on the use of these areas (SAIC 1998).

2.6 HYDROGEOLOGY

The unconsolidated till at FBH is primarily fine grained (some sand and gravel in a clay/silt matrix) and tends to limit groundwater movement. Within the fine-grained till units are discontinuous coarse-grained layers. These coarse-grained layers, predominantly sand or gravel, act as aquifers within the area. All coarse-grained layers within the shallow till unit are identified as the shallow aquifer, all coarse-grained layers in the middle till unit are identified as the middle aquifer, and the sand and gravel layer in the deep

till unit is identified as the Fall Creek aquifer. In 1998, the U.S. Geological Survey (USGS) measured groundwater levels from a network of 24 monitoring wells over a wide geographic range. Depths to water ranged from 2.65 to 25.02 feet below top of casing (btoc) in the shallow aquifer, 9.96 to 45.22 feet btoc in the middle aquifer, and 72.71 to 98.49 feet btoc in the Fall Creek aquifer (USGS 1999).

Groundwater in the vicinity of FBH that is suitable as a drinking water supply is obtained both from the deep, unconsolidated sand and gravel deposits and the underlying bedrock. The primary groundwater flow direction within these formations is northwest toward Fall Creek. However, groundwater in the northern portion of FBH flows from the relatively higher water level area at Geist Reservoir, located to the northeast of FBH, toward Fall Creek.

A bedrock aquifer lies just beneath the glacial-outwash aquifer at an average depth of 170 to 250 feet bgs. Wherever the bedrock aquifer system occurs, the highest yield of water usually occurs within the first 100 feet of bedrock. Due to the sand and gravel lenses that overlie the bedrock aquifer, springs and seeps are common throughout FBH (SAIC 1998).

2.7 SURFACE WATER HYDROLOGY

FBH lies primarily in the Lower Fall Creek Watershed (CBBEL 2009). Surface drainage from FBH is primarily to the northwest, ultimately entering Fall Creek. Four major streams (Fall Creek, Lawrence Creek, Mud Creek, and Indian Creek) and three intermittent streams (Camp Creek, Fort Branch, and Schoen Creek) constitute the surface drainage system. Stormwater runoff from FBH is discharged to these streams via storm sewers and/or overland flow. Three reservoirs (Delaware Lake, New Lake, and Duck Pond) were constructed during the operational period at FBH. Based on aerial imagery, Delaware Lake was constructed between 1941 and 1945, Duck Pond was constructed between 1945 and 1948, and New Lake was created as part of the golf course construction between 1966 and 1971 (Environmental Research, Inc. 1996). These three reservoirs are now part of the Fort Harrison State Park and the Fort Golf Course, are stocked with fish, and are designated as fishing and recreational areas. Geist Reservoir stores supplies of emergency drinking water to the city of Indianapolis and surrounding communities and is located approximately 1.5 miles upstream (northeast) of FBH (SAIC 1998). The surface water features at FBH are presented in Figure 2-1.

2.8 WATER USAGE

Two well field protection areas (WFPAs), the Geist WFPA and the Lawrence WFPA, are located in the northern and southwestern portions of FBH, respectively (CBBEL 2009). Two public water supply systems, the Indianapolis Water Company (IWC) (now Citizens Energy Group) and the City of Lawrence Water Company, draw their drinking water from the aquifers that underlie FBH (SAIC 1998). Citizens Energy Group withdraws its water supply from White River, Fall Creek, Eagle Creek Reservoir, and six well fields located along Fall Creek, including the Lawrence and Geist Well Fields (The Indianapolis Public Library 2021). The city of Lawrence withdraws its drinking water from well fields that yield water from both the glacial till and bedrock aquifers (SAIC 1998).

Supply wells drilled into the thick alluvial and glacial outwash material along Fall Creek are the best producers, with well yields up to 500 gallons per minute. Water levels in wells completed in the glacial till aquifer range from 13 to 21 feet bgs, and water levels in wells completed in the bedrock aquifer range from 103 to 134 feet bgs (SAIC 1998).

According to the Indiana Department of Environmental Management (IDEM), Division of Water Ground Water Database, 724 unconsolidated wells and 160 unspecified wells are registered by the Indiana DNR and are present within a 4-mile radius of FBH. Twenty significant withdrawal (public water supply) wells are located within a 4-mile radius of FBH. The EDR report identified 100 well records located within 1 mile of FBH, which include monitoring wells or methane monitoring wells associated with landfills. Data in the EDR report were verified using the Indiana DNR Water Well Record Database (Indiana DNR 2021). Only

49 wells were reported in the Indiana DNR dataset; however, methane wells and monitoring wells associated with the Army-owned sanitary landfill located on FBH were not reported. No wells were identified to be located on existing Army/U.S. Government property at FBH Building 1 or the Army Reserve. The records reviews and related activities did not identify residential/private wells in the area. Additional verification may be required to confirm the accuracy of residential wells that exist on-post or downgradient from FBH. Multiple public water supply wells were identified in the area of FBH, as described below:

- Three public water supply wells owned by Lawrence Utilities are located on FBH property in the northeastern portion of FBH and are used for public water supply by the city of Lawrence. These three wells were registered with the State of Indiana as significant water withdrawal facilities in 1986, prior to the closure and transfer of FBH. FBH transferred on-post potable supply wells to the city of Lawrence upon closure in 1995.
- Eleven public water supply wells are located to the northeast (off-post) of FBH and are used for public water supply by the city of Lawrence and Citizens Energy Group. These 11 wells were registered with the State of Indiana as significant water withdrawal facilities in the late 1980s and early 1990s.
- Four public water supply wells owned by Lawrence Utilities are located upgradient to the southwest (off-post) of FBH and are used for public water supply by the city of Lawrence. These four wells were registered by the city of Lawrence in 1984 as significant water withdrawal facilities.
- One well in the southeastern portion of FBH and three surface water intakes in Delaware Lake in the north-central portion of FBH are used for irrigation by the Fort Golf Course. These wells/intakes were registered as significant water withdrawal facilities in 1986.

Figure 2-4 shows public water supply wells and surface water intakes within 4 miles of FBH.

2.9 ECOLOGICAL PROFILE

FBH consists of approximately 2,392 acres (U.S. Army 2020). Environmentally sensitive areas at FBH include various wetlands, habitat areas for the endangered Indiana bat (*Myotis sodalis*), several species of state-listed endangered species, sites of archaeological investigations, historically significant buildings, and the site of a private cemetery (U.S. Army 2020).

Approximately 1,069 acres at FBH are covered by woodland (USAEC 1994). Dominant species of trees in the woodlands include red oak (*Quercus rubra*), green ash (*Fraxinus pennsylvanica*), sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), black walnut (*Juglans nigra*), and cottonwood (*Populus* spp). Developed areas are covered with lawn grasses and various ornamental and shade trees, including tulip (*Liriodendron tulipifera*), sweet gum (*Liquidambar* spp.), Ohio buckeye (*Aesculus glabra*), and several varieties of crabapple trees. Freshwater forested shrub wetlands are present along Fall Creek and the southern end of New Lake (NWI 2023). The three man-made reservoirs (Delaware Lake, New Lake, and Duck Pond) are open water wetlands (USAEC 1994).

Primary game species at FBH include the fox squirrel (*Sciurus niger*), whitetail deer (*Odocoileus virginianus*), bobwhite quail (*Colinus virginianus*), and mourning dove (*Zenaida macroura*). FBH contains significant parcels of floodplain and upland forest tasks and is considered an important bird area. Summer counts and surveys for breeding birds often exceed 80 species (Audubon 2023). Common species of birds include the American robin (*Turdus migratorius*), northern cardinal (*Cardinalis cardinalis*), Carolina chickadee (*Poecile carolinensis*), and red-bellied woodpecker (*Melanerpes carolinus*). Birds that can be commonly seen in the riparian area include the wood thrush (*Hylocichla mustelina*), cerulean warbler (*Dendroica cerulea*), prothonotary warbler (*Protonotaria citrea*), Acadian flycatcher (*Empidonax wrightii*), and Louisiana waterthrush (*Parkesia motacilla*) (Audubon 2023). In addition, the riparian habitat supports

a significant great blue heron (*Ardea herodias*) rookery (Hankins 2022). Game fish found in the man-make lakes include largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), channel catfish (*Ictalurus punctatus*), crappie (*Pomoxis annularis*), bullhead (*Ameiurus* spp.), and trout (*Salvelinus namaycush*) (USAEC 1994).

The U.S. Fish and Wildlife Service (USFWS) Environmental Conservation Online System (ECOS) Information for Planning and Consultation (IPaC) tool identified two federally listed threatened and endangered (T&E) bat species as potentially occurring on or near FBH. These species include the Indiana bat (*M. sodalis*) and the northern long-eared bat (*Myotis septentrionalis*). The T&E candidate species, the monarch butterfly (*Danaus plexippus*), was also identified by IPaC as potentially occurring at FBH (USFWS 2023). Summer nursery roosts of the Indiana bat using the undeveloped forests areas of FBH have been identified (CDM 2003). In addition, the host plant of the monarch butterfly, milkweed, is present at FBH.

Eleven migratory birds of particular concern are identified by the IPaC tool as potentially occurring on or near FBH. These birds include species such as the cerulean warbler (*D. cerula*), bald eagle (*Haliaeetus leucocephalus*), black-billed cuckoo (*Coccyzus erythropthalmus*), red-headed woodpecker (*Melanerpes erythrocephalus*), and lesser yellowlegs (*Tringa flavipes*) (USFWS 2023).

2.10 CLIMATE

The average temperature at FBH is 50.5°F, which is slightly lower than the Indiana average temperature of 51.8°F and the national average temperature of 54.5°F. The annual rainfall amount is 40.28 inches with 75.94 days of 0.1 inches or more of precipitation. USGS estimates annual aquifer recharge in the vicinity of FBH ranges from approximately 3.5 to 6.5 inches per year (IGS 2021). The annual snowfall amount is 23.43 inches with 21.54 days of 1 inch or more of snow. Average wind speed for the area is 16.97 miles per hour (USA.com 2021).

3. PA ANALYSIS

The primary components of the PA are records reviews, analysis of aerial photographs, a site visit, and interviews. The following sections summarize the methods used and activities conducted for the FBH PA. The reference to "on-post" refers to property that has been or still is owned by the Army. Any references to "off-post" refers to areas that have never been owned by the Army.

3.1 RECORDS REVIEW

Prior to the records review, site visit, and interviews, a kickoff meeting was held between BRAC, the U.S. Army Corps of Engineers (USACE), and Leidos on May 27, 2021. The purpose of the kickoff meeting was to present all parties' preliminary knowledge of FBH to inform the PA and site visit. The final kickoff meeting minutes are presented in Appendix A.

Preliminary research was conducted prior to the site visit to determine the potential for use, storage, or disposal of PFAS-containing materials, including if any of the following activities were conducted at FBH:

- On-post fire training
- Use of PFAS-based AFFF in fire suppression systems or other systems
- AFFF used, stored, or disposed of at buildings and emergency response sites
- Activities or materials used that are likely to include PFAS-containing materials
- Studies conducted to assess the environmental impacts of PFAS-containing materials
- Review of potential off-post sources.

The records review included a combination of Internet-based searches and reviews of aerial photography, historical maps, library collections, technical reports, previous studies, and investigations available online. In addition, an EDR search of state and Federal environmental databases for FBH and any listed sites within a 1-mile search distance was conducted (EDR 2021).

The PA team completed a records review of available environmental investigations conducted under CERCLA and Resource Conservation and Recovery Act (RCRA) regulatory programs. In addition, the PA team reviewed internal Army documents that were available in the Administrative Record managed by IDEM, which included more than 400 records of inspection reports, regulatory correspondence, installation maps, and a Community Environmental Response Facilitation Act (CERFA) report. Table 3-1 lists the documents reviewed that are relevant to the evaluation of AOPIs in this PA. A list of sources reviewed is provided in Appendix B.

Records that were transferred as part of closure operations from the Army to FHRA were requested for review. This included information contained in the FBH Administrative Record. Based on a telephone call on August 2, 2021, FHRA indicated they have binders of parcels, transfers, and some Phase I reports in a storage facility. FHRA indicated they do not have Army materials, and many records have been destroyed.

Information gathered during the records reviews resulted in identifying data gaps and eliminating a variety of areas based on their historical use. Data gaps associated with Fort operations, PFAS releases, and current exposure receptors at FBH provide rationale for a conservative approach for identifying AOPIs. However, areas with little potential to result in a PFAS release, such as residential buildings, hospitals, cafeterias, and recreational areas, were eliminated for further evaluation early on in the PA process.

Areas that were identified to have potentially used PFAS-containing materials or had the potential for an AFFF release were further evaluated.

Information gathered during the records reviews helped identify data gaps and enabled elimination of several areas based on their historical use. Data gaps associated with facility operations; PFAS-containing material use, storage, or disposal; and current exposure receptors at FBH contributed to a conservative

approach for identifying AOPIs. However, areas with little potential to result in a PFAS release, such as residential buildings, hospitals, cafeterias, and recreational areas, were eliminated from further evaluation early on in the PA process.

Areas identified to have potentially used, stored, or disposed of, or had recorded the potential for a release of PFAS-containing materials, including AFFF, were further evaluated.

Table 3-1. Summary of Relevant Records Reviewed

Document Title	Author	Date	Relevance
Enhanced Preliminary Assessment, Fort Benjamin Harrison, Indiana	Roy F. Weston, Inc.	February 1992	Provides information for AOPIs
IDEM Website	IDEM	Accessed February 25, 2021	History and summary of FBH and PFAS regulatory information; well records
Endangered Species, Find Endangered Species	USFWS	Accessed July 7, 2021	Ecological profile information
Marion County, Indiana Weather	USA.com	Accessed July 7, 2021	Climate information
Lower Fall Creek Watershed Management Plan	CBBEL	May 2009	Information on surface water hydrology
Phase II Environmental Investigation Report, Fort Benjamin Harrison, Marion County, Indiana	SAIC	August 1998	Physical setting (i.e., topography, geology, hydrogeology, surface water hydrology)
Lawrence Township, Marion County, Indiana Census Data	U.S. Census Bureau	Accessed July 8, 2021	Demographics information
Technical Sampling Plan for Fort Benjamin Harrison RCRA Facility Investigation, Marion County, Indiana	HLA	August 25, 1993	Provides information for AOPIs
Pipeline Accident Report, Natural Gas Explosion and Fire, Department of Defense/Army, Fort Benjamin Harrison, Indianapolis, Indiana	National Transportation Safety Board	April 8, 1992	Describes emergency response to a natural gas explosion and fire at FBH
Final Environmental Impact Statement for Fort Benjamin Harrison, Indiana Disposal and Reuse	DOA TRADOC	January 1995	Information for AOPIs

3.2 AERIAL PHOTOGRAPHIC ANALYSIS

During the completion of the PA included review of 80 historical aerial photographs spanning from 1936 to 1995, as presented in the *Aerial Photographic Record-Version III, Fort Benjamin Harrison, Marion County, Indiana* (Environmental Research, Inc. 1996). Ten aerial photographs from 1998 to 2018 available at historicaerials.com, and 14 aerial photographs (dated 1936 to 2016) provided by EDR (EDR 2021) were also reviewed. The aerial photographs were analyzed to identify potential activities or developments that may suggest the potential use, storage, or disposal of PFAS-containing materials, including AFFF (e.g., evidence of fire training activities, such as fire pits or burn scars). Analysis of the historical aerial photographs did not identify evidence of fire training activities at FBH. The aerial photographic analysis is summarized as follows:

- **1936 –** The 1936 aerial photographs show some development in the southeast and south-central portion of FBH, including in the area of the West Landfill. The railroad tracks that border FBH to the southeast are visible and appear to branch and extend into the central portion of FBH. The

northern, eastern, and western areas of FBH appear agricultural with little to no development; however, roads are visible.

- **1941 –** The central area is more heavily developed. Four rows of buildings were constructed on a rectangular section of land directly west of the railroad tracks. Clearing and additional roads are visible to the southwest of FBH, west of the primary development.
- **1945 –** Additional construction (i.e., roads and buildings) in the southwestern section of FBH. The West Landfill is predominant. Railcars and buildings are observed in the south-central section. The northern areas show little development.
- **1948, 1949, and 1950 –** Additional buildings constructed in the northern section and construction continues to the north of the south-central section of FBH.
- **1951 –** Beginning stages of construction of a runway is visible in the area to the south of Lawton Loop and northwest of the railroad tracks.
- **1952 –** Building 1 is visible where the runway was observed in the 1951 photograph.
- **1956 –** Building 1 appears to be completed and functional (e.g., landscaping, parked vehicles). Clearing is visible to the east and west of Lee Road in the east-central section of FBH. The areas bordering FBH to the south, southwest, and west are under substantial residential development.
- **1958 and 1962 –** The layout of FBH in similar to the 1956 photograph with the addition of land clearing, access roads, and a few buildings in the northern area of FBH.
- **1966 –** The golf course is present to the northwest of Shafter Road and substantial clearing is visible to the north of the golf course.
- **1972, 1978, 1983, 1985, 1986, 1991, and 1992 –** Gradual vegetation growth is visible throughout the facility; however, substantial developmental changes did not occur from 1972 to 1991. Several buildings were constructed in the southern area of the golf course. In addition, the railroad that extended through the south-central section of the facility faded and appears to have been removed by 1991.
- **1993 and 1995 –** The East Landfill was partially converted to baseball fields on the eastern half in 1993, and the entire area was converted to baseball fields in 1995.
- **1998 –** Several structures are removed, including the majority of the Building 810 WWTP structures, the buildings in the southern portion of the golf course, and several structures in the south-central section of FBH.
- **2003, 2004, and 2005 –** The area associated with the Building 810 WWTP is grass covered. Multiple new buildings are present in the southeastern and south-central areas of FBH, including the city of Lawrence Fire Station 40. A housing development is also located in the southwestern section of FBH.
- **2008, 2010, 2012, 2014, 2016, and 2018 –** Each aerial photograph from 2008 to 2018 presents continued development at FBH. Multiple recreational attributes such as soccer fields and green spaces, as well as commercial and residential buildings, are visible.

Aerial photographs are compiled in Appendix C. Due to the breadth of aerial photographs reviewed, only relevant photographs are provided as part of this PA Report.

3.3 PA SITE VISIT

The PA site visit was conducted on August 5 and 6, 2021. The PA site visit included a site walk and visual inspection of all readily accessible areas at FBH to identify potential sources of PFAS and gather information for developing CSMs at AOPIs identified during the records review. It was determined during

the site visit that the U.S. Army Reserve Enclave was a secure facility. Access was not obtained at the U.S. Army Reserve Enclave during the site visit to access buildings/interiors within the Reserve; however, the facility was visually observed from the perimeter fence to obtain information necessary for this PA. In addition, access routes were assessed in consideration for SI sampling at AOPIs. Appendix D contains photographs from the PA site visit.

Prior to the site visit, the PA team corresponded with FHRA to request historical documents, site knowledge, and information for potential interviewees. The PA team further notified FHRA of the site visit and scheduled a mutually agreeable meeting time with the executive director and director of operations of the organization. FHRA did not attend the meeting and did not provide requested records access. FHRA did not respond to subsequent communications made in an attempt to obtain information.

3.4 SUMMARY OF INTERVIEWS

Prior to the site visit, the PA team developed and distributed a PFAS PA Questionnaire for gathering information related to PFAS usage at FBH from key Army personnel. Two individuals responded to the questionnaire; the questionnaire responses are presented in Appendix E. The primary goal of the questionnaire was to identify whether PFAS-containing materials and AFFF were used on-post, where they were used, how much was used, how much remains, and whether any releases may have occurred.

In addition, Lawrence Department Fire Chief was interviewed prior to the site visit. Due to the length of time that FBH has been closed under BRAC, many applicable former employees and personnel are no longer available/accessible for interviews. Attempts were made to contact others to complete interviews and/or questionnaires, but no responses were received.

Table 3-2 summarizes the interview conducted and relevant information of PFAS usage.

Table 3-2. Interview Conducted for PA

Title	Date	Information Provided
Lawrence Fire Department Fire Chief	July 26, 2021	This individual has been at the Lawrence Fire Department since 1999. The following information was provided: • Fire Station 40 of the Lawrence Fire Department was established on-post after BRAC closure and transfer. • Two on-post fire stations were used by the Army and closed prior to 1999: Fire Station No. 1 and Fire Station No. 2. • One FTA was used by the Army in the open field to the east and southeast of Building 107 (across the street from Fire Station No. 2). • Fire suppression systems containing AFFF or equipped with proportioners for distributing AFFF have not been observed in any FBH buildings. • AFFF would not have been used for mitigating a natural gas fire. • The Lawrence Fire Department o Stores approximately 15 gallons of AFFF in 5-gallon buckets on each of three fire trucks. o Does not use AFFF for fighting fires; however, they occasionally use it for mitigating fuel spills. • Has used AFFF at the FTA located north of Fire Station 40. The Lawrence Fire Department FTA and Fire Station 40 are located on-post within the former FBH property boundary.

The following summarizes information obtained regarding potential, use, storage, or disposal of PFAS-containing materials at FBH based on the interview conducted and questionnaires completed:

- The interviewee indicated that the Army Fire Department performed fire training activities in the area to the east and southeast of Building 107 (across the street from Fire Station No. 2) prior to closure in 1995. The location was described by a former colleague who had worked with the Army Fire Department prior to transitioning to the Lawrence Fire Department. The name and contact information for the colleague was not provided and the person has since retired. The interviewee did not know the frequency of fire training activities or the amount and type of materials that were used.

Interview data did not confirm that AFFF was used, stored, or disposed of by the Army Fire Department. Given the time frame of operation and known presence of foam on-post based on available documentation for spill cleanup discovered as part of records review, it is possible that AFFF was used by the Army and was potentially discharged at the Fire Station No. 2 fire training area (FTA), as shown in Figure 4-1.

4. SUMMARY OF PA DATA

4.1 PREVIOUS PFAS INVESTIGATIONS

In 2012, USEPA published the Third Unregulated Contaminant Monitoring Rule (UCMR3), which required nationwide public water systems to sample for a list of 30 unregulated contaminants, including 6 constituents of interest (COIs) relevant to this PA (i.e., PFOS, PFOA, PFBS, PFNA, perfluoroheptanoic acid [PFHpA], and PFHxS). As part of the UCMR3 sampling, the Lawrence Utilities community water systems were sampled in 2013 and 2014. The six PFAS sampled were not detected in the Lawrence Utilities, including supply wells located within post limits at FBH (Figure 2-3) (IDEM 2021). In 2021, USEPA published the Fifth Unregulated Contaminant Monitoring Rule (UCMR5), which required nationwide public water systems to sample for a list of 30 unregulated contaminants between 2023 and 2025, including 29 PFAS relevant to this PA. As part of the UCMR5 sampling, the Lawrence Utilities and Citizen's Energy Group community water systems are proposed for sampling in 2023 (IDEM 2023, USEPA 2023). No site-specific investigation has been conducted at FBH prior to this PA.

4.2 EVALUATED SITES

During the PA records reviews, interviews, aerial photographic analysis, and site reconnaissance, the PA team investigated available documentation and physical evidence for areas having a potential historical PFAS release. The sites evaluated include fire stations; FTAs; landfills; metal plating operations; WWTPs; pesticide facilities; vehicle maintenance shops, which used car washes and engine lubricants; paint shops; and photographic processing facilities, as shown in Figure 4-1 and described in the following sections.

4.2.1 AFFF Use, Storage, and Disposal

Documentation specifying the use of AFFF at FBH was not identified during the records reviews, interviews, aerial photographic analysis, or site visit conducted as part of this PA. However, given the period of operation and type of activities conducted at FBH, including documented "foam" use by the FBH Fire Department on a spill report, AFFF was possibly used and stored at FBH while operational. The areas identified as potential areas of historical AFFF usage and/or storage at FBH are discussed below.

Foam was used to mitigate a gasoline spill at the direction of the Post Fire Department on November 5, 1988, as detailed in Section 5.2.3. The use of foam at the gas station indicates that the Post Fire Department at FBH potentially used AFFF; therefore, AFFF may have been released during fire training activities, emergency response operations, or AFFF storage operations. The spill report detailing the event and foam use is provided in Appendix F.

Two fire stations and four FTAs (Figure 4-1) were identified during records reviews and interviews conducted prior to the site visit as potential AFFF use, storage, and disposal areas requiring further evaluation in this PA:

- Fire Station No. 1 and Fire Hose House (Buildings 623 and 624)
- Fire Station No. 2 (Building 116)
- FTA North of Building 518
- FTA East of the West Landfill
- Fire Station No. 2 FTA
- Building 810 FTA.

Precise dates of operation are not available for the fire stations; however, the *Final Environmental Impact Statement for Fort Benjamin Harrison, Indiana Disposal and Reuse* (DOA TRADOC 1995) indicates that both fire stations were active in 1995 prior to closure.

Fire Station No. 1 – Fire Station No. 1 (Building 624) is located on Kent Ave., east of the officer family housing on Lawton Loop Drive in the western portion of FBH. The earliest date of operation of Fire Station No. 1 is from a photograph dated 1908. A support building, the hose house identified as Building 623, was constructed during WWII and was demolished between 1998 and 2003 based on available aerial imagery. The Fort Harrison Reuse Plan specified that the city of Lawrence was requesting Building 624 (the base fire station) and the necessary facilities and equipment associated with maintaining the building as a fire station (Designplan, Inc. 1994). The Fort Harrison Reuse Plan also specified retention of the fire station as a non-DOD operation. Building 623 was listed for demolition in the FBH Preliminary Plan for Planned Unit Development (Clark 1997). It is unknown whether the facility was used as a fire station post transfer. It was noted by the Lawrence Fire Department Fire Chief as part of the interview that the FBH fire station was closed by 1999. The Fire Station No. 1 structure still exists and is currently used as a commercial business. No information was located to document the presence of AFFF at the fire station; however, it was known the FBH used foam products on spills on-post.

Fire Station No. 2 – Fire Station No. 2, Building 116 or T-116 was located on the eastern portion of FBH along Beaumont Road. The location of the former fire station is located on the current U.S. Army Reserve Enclave. The 1990 Base Closure Act mandated that a Reserve Enclave be retained at FBH. The Reserve Enclave did not know of the former presence or use of Fire Station No. 2 at FBH. The dates of operation of Fire Station No 2 are unknown. No information was located to document the presence of AFFF at the fire station; however, it was known the FBH used foam products on spills on-post. Precise dates of operation, materials used, and frequency of use are unknown for the FTAs. However, the Army has not used any FTAs since post closure in 1995, and the Army Reserve does not use FTAs. Four FTAs were identified at FBH.

FTA North of Building 518 – Analysis of aerial photographs suggests that the FTA North of Building 518 was inactive following 1956. Therefore, the operational time frame predates widespread AFFF use, and it is unlikely that an AFFF release occurred at the FTA North of Building 518.

FTA East of the West Landfill – Aerial photographs indicate that the FTA East of the West Landfill may have been operational from 1941 through the mid-1970s. Therefore, it is possible that AFFF was released at the FTA East of the West Landfill in the early 1970s.

Fire Station No. 2 FTA – The Fire Station No. 2 FTA was located across Beaumont Road from Fire Station No. 2 on the eastern and southeastern sides of Building 107. The Fire Station No. 2 FTA was used prior to closure in 1995; however, dates of operation were unknown (Lawrence Fire Department 2021).

Building 810 FTA – The Building 810 FTA was located at the former Building 810 WWTP following closure of the WWTP in 1980. Based on the available data in the 1992 U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) Enhanced PA (Weston 1992), the aerial photographs, and the 1995 Environmental Impact Statement (EIS) (DOA TRADOC 1995), the Building 810 FTA was active from approximately 1980 to 1995 prior to closure.

4.2.2 Metal Plating Operations

No current or historical metal plating operations were identified at FBH.

4.2.3 Wastewater Treatment Plants

Sanitary wastewater was treated on-post from 1913 until November 1980. Three WWTPs (Figure 4-1) were identified at FBH during records reviews:

- WWTP North of Building 509
- WWTP West of Building 674
- Building 810 WWTP.

Operational records do not exist for two of the WWTPs (North of Building 509 and West of Building 674). Historical site maps from 1913 and 1938 indicate the locations of the WWTPs (HLA 1995). Based on the aerial photographic analysis, the WWTP North of Building 509 appears to have been demolished prior to 1951 and the WWTP West of Building 674 appears overgrown by 1971. Therefore, the operational time frames for these two WWTPs are suspected to predate widespread PFAS and AFFF use.

The Building 810 WWTP was located to the south of Shafter Road in the northwestern portion of FBH until its closure in 1980. During its operation, effluent from the WWTP was discharged to Fall Creek under a National Pollutant Discharge Elimination System (NPDES) permit. During FBH operations, the vehicle maintenance shops and wash racks were equipped with oil/water separators (OWSs) that drained to the sanitary sewer system, which likely drained to the WWTP.

In 1980, the sanitary sewer system was connected to the off-Post Indianapolis regional sanitary sewer system, which discharges to a publicly owned treatment works, and the Building 810 WWTP was closed. The sludge from the drying beds was then excavated and disposed of at an unspecified sanitary landfill (Weston 1992). During the operational period of the Building 810 WWTP, biosolids and sludge were likely transferred to the West Landfill at FBH. Additional details regarding the West Landfill are provided in the following section.

4.2.4 Landfills

Two former landfills have been identified at FBH: the East Landfill and the West Landfill.

Little information is available on past operations at the East Landfill (also known as the Closed East Landfill or the Lee Road Dump). The 1992 USATHAMA Enhanced PA (Weston 1992) indicated that the landfill operated from the early 1940s to 1968. However, aerial photographs show that trench filling operations began in approximately 1958 and continued through 1966. According to the 1992 USATHAMA Enhanced PA (Weston 1992), the East Landfill received similar wastes to that of the West Landfill, as described below. The fill area of the East Landfill is approximately 29 acres, most of which was deeded to the city of Lawrence in 1974. In 1997, USGS completed analytical sampling at the landfill. The investigation concluded that the data collected did not indicate adverse effects of the East Landfill on groundwater quality (USGS 1999). Given the operational period of the East Landfill, it did not likely receive PFAS-containing materials.

The West Landfill (also known as the Glenn Road Landfill) began operation by at least 1936 and ceased operation on October 1, 1991. The landfill received office and household wastes, tires, ash from the boiler plant, autoclaved waste from the hospital, construction and demolition debris, and tree trimmings. Hazardous wastes and petroleum products, such as used oils, solvents, pesticides, and paints, could have been disposed of in the landfill. The landfill was issued a "construction plan" permit on May 16, 1980, and later operated under Indiana Permit No. SW231. In 1993, IDEM approved the *Closure/Post Closure Plan and Specifications for the Glenn Road (West) Landfill* (U.S. Army 1993) and closure activities commenced. In October 1997, closure activities were completed and a closure certification report was submitted to IDEM. Groundwater monitoring activities have continued annually since that time, and analytical results indicate that concentrations of arsenic and vinyl chloride exceed the USEPA maximum contaminant levels. At the time of this report, the West Landfill is recommended for transfer to the Indiana DNR.

Multiple historical dump sites were identified during archaeological studies at FBH; however, the periods of operation predate the widespread use of PFAS and AFFF (SAIC 1998).

4.2.5 Other Potential Sources of PFAS

In addition to AFFF-related PFAS sources, other potential sources of PFAS may be associated with the use of some types of pesticides, car washes, engine lubricants, paint shops, laundry or waterproofing facilities, and photographic processing facilities. Document research, site visit, and interviews resulted in

identification of other potential PFAS sources at the Installation. The following bullets describe the potential non-AFFF sources at FBH:

- **Vehicle Maintenance** – Eleven maintenance shops and areas were identified as part of records review. Three of the vehicle maintenance areas are located on the current U.S. Army Reserve Enclave.
- **Wash Racks** – Twelve wash racks/grease racks or OWSs were identified from records review (Weston 1992). Water from the wash racks and OWSs would have been discharged to the sanitary sewer system and ultimately to a WWTP (discussed in Section 4.2.3) and/or regional sewer district based on time of operation. Although a complete list of products used for wash rack operations is not available, it is understood that common products used in vehicle washing may have contained minor amounts of PFAS-containing materials and would not be considered a significant source of PFAS contamination. As a result, the potential PFAS impacts were determined to be unlikely. Significant PFAS impacts would have been more likely from emergency vehicles being serviced at the wash racks.
- **Pesticides** – Five buildings were identified for the mixing and storage of pesticides. Although a complete list of pesticides used, stored, or disposed of at FBH is not available, the use of fluorinated pesticides was infrequent until about the mid-2000s (Alexandrino et al. 2022). Given the operational period of FBH, the likelihood of PFAS impacts due to pesticide use, storage, or disposal is assumed to be low.
- **Laundry** – No commercial laundry facilities were identified as part of records review. Records indicate that laundry and dry cleaning was collected in Building 20 and taken off-post for laundering (ESE 1984).
- **Helipads** – Two helipads were documented at FBH, one at Building 1 and one at the FBH hospital. Neither helipad remains at FBH. It is unknown whether AFFF was ever used near the helipads; however, no crash records were located with the Bureau of Aircraft Accidents Archives. Therefore, AFFF use associated with the helipads was unlikely.
- **Photographic Processing Shops** – Six photographic processing areas were identified at FBH. Documentation indicated that the photographic processing shops discharged fixative photographic solution wastes, waste xylol and acetone, and ammonia-containing blueprinting solution to the WWTP either directly or through sink drains that led to the sanitary sewer (Weston 1992). Records were not located to indicate that photographic solutions used at FBH contained PFAS. One record of improper disposal and spill of photographic chemicals at the West Landfill in October 1982 was discovered as part of record review. The record indicated that the chemicals were retrieved and properly disposed of with the surrounding soil also removed. The spill record is provided in Appendix F. A complete list of photographic processing chemicals used, stored, or disposed of at FBH is not available. However, the use of PFAS-containing materials did not become prevalent in the photography industry until approximately the mid-1990s (Kodak 2002). Given the operational period of FBH, the likelihood of PFAS impacts due to the use, storage, or disposal of photographic processing chemicals is assumed to be low.
- **Incinerator** – An incinerator and adjacent scrap yard were identified west of Lee Road and the East Landfill. The time frame of incinerator usage predates the widespread use of PFAS and AFFF.
- **Patriotic Site** – The patriotic site is located southwest of Building 1 in an open field. The site consisted of a 3- by 10-foot pit measuring 2 feet deep for a flag decommissioning by burning

ceremony. Evidence on how the fire was extinguished was not found; however, interview notes from the Lawrence Fire Department Fire Chief state that fires were not extinguished with AFFF and it was more commonly used for spills.

- **Paint Shop** – Records indicate a fire occurred at the furniture repair shop/former paint shop in 1978-1979. No indication was found that AFFF was used to extinguish the fire (SAIC 1995). The building number was not disclosed.

During the document research and site visit, no additional potential use, storage, or disposal of PFAS-containing materials was identified.

4.3 POTENTIAL OFF-POST AND POST TRANSFER PFAS SOURCES

An exhaustive search to identify all potential off--post PFAS sources (i.e., not related to operations at FBH) is not part of the PFAS PA program. However, a search of significant potential contributors (e.g., airports, landfills, WWTPs) was performed. In addition, EDR conducted a search of state and Federal environmental databases for FBH and adjacent properties (EDR 2021). Research of parcel data for new property owners within the facility boundary was also performed to determine the current site usage and evaluate the potential for PFAS use/release. Post transfer parcels and their current ownership is presented in Figure 4-1. Potential off-post PFAS sources within a 5-mile radius of FBH that were identified during the records reviews, interviews, and site visit are described below and presented in Figure 4-2.

Two fire departments, the Lawrence Fire Department and the Indianapolis Fire Department, respond to emergencies in the city of Lawrence. The Lawrence Fire Department is composed of four fire stations, one of which (Fire Station 40) is located on-post in the central eastern area of FBH. Three additional city of Lawrence fire stations are located off-post and south (upgradient) of FBH. Twenty-two additional fire stations are located off-post within a 5-mile radius of FBH (Figure 4-2).

On July 26, 2021, an interview was conducted with the Lawrence Fire Department Fire Chief. The chief indicated that approximately 15 gallons of AFFF are stored in 5-gallon buckets on each of three of the Lawrence Fire Department fire trucks. He also indicated that AFFF has been used in the firefighting training tower located directly north of Fire Station 40 within the boundary of FBH. The quantity of AFFF used, as well as the frequency and dates of these activities, were unknown.

The U.S. Army Reserve Enclave occupies the eastern portion of FBH. No current fire department or fire training activities are conducted on the property.

The fire stations, car washes, a landfill, a WWTP, helipads, and two airports, which are located within a 5-mile radius of FBH, are shown in Figure 4-2. Both Indianapolis Metropolitan Airport and Indianapolis Regional Airport have used AFFF for fire training and/or fire response. The FBH Helipad and the FBH Hospital Helipad, both located at FBH, were retained by the Army on property transferred to the U.S. Army Reserve Enclave. Both FBH helipads no longer exist. The Community Hospital north of (downgradient from) FBH contains a helipad. Crash records were not present for the helipad, and no indication whether AFFF was ever used at the site was found during the records review. The upgradient landfill to the southwest of FBH, Wetzel Solid Fill Site, was reportedly used to dispose of cinders, concrete, calcium silicate, and brick.

5. SUMMARY OF PA RESULTS

The areas evaluated for potential PFAS use, storage, or disposal at FBH were further refined during the PA process and categorized as an AOPI or not retained. Areas not retained as AOPIs are discussed in Section 5.1. AOPIs are discussed in Section 5.2.

5.1 AREAS NOT RETAINED AS AOPIs

Based on analysis of information obtained during this PA, the areas described below were not retained as AOPIs. These areas were previously identified as potential PFAS sources (e.g., car washes, automobile maintenance, paint shops, photographic processing, pesticide use or storage, WWTPs, landfills) at FBH. However, PA research does not indicate that PFAS-containing materials were used, stored, or disposed of at these areas. A brief site history and the rationale for eliminating the areas as AOPIs are presented in Table 5-1.

Table 5-1. Summary of Areas not Retained as AOPIs at FBH

Area Description	Dates of Operation	Relevant Site History	Rationale
DPCA Field Printing Shop (Building 1)	Unknown (active in 1992)	Produced prints, photographic copy, and graphics. Wastes stored in plastic-lined containers on loading dock adjacent to building and print shop activities contained within the building.	No evidence that PFAS-containing materials were used, stored, or disposed of.
Graphics Shop (Building 1)	Unknown (active in 1992)	Used for blueprinting, sign printing, silk screening, and minor amounts of photographic processing. Screen printing and blueprint solutions were poured down a sink that drains to the sanitary sewer.	No evidence that PFAS-containing materials were used, stored, or disposed of. Although products used in photographic processing have the potential to contain PFAS, no evidence (e.g., chemical inventories) obtained indicated that the specific photographic processing solutions used at FBH contained PFAS or what quantities could have been disposed of (as presented in Section 4.2.5). As a result, the photographic processing centers were not identified as AOPIs.
TASO Devices Shop (Buildings 479 and 481)	Unknown (active in 1992)	Building 479 was used for graphic services, photographic processing and copying, and video services. Building 481 was used for wood shop and materials storage, including paints, paint thinner, and solvents/cleaning agents. Activities were contained within the building and drains associated with the photographic process led to the sanitary sewer.	No evidence that PFAS-containing materials were used, stored, or disposed of. Although products used in photographic processing have the potential to contain PFAS, no evidence (e.g., chemical inventories) obtained indicated that the specific photographic processing solutions used at FBH contained PFAS or what quantities could have been disposed of (as presented in Section 4.2.5). As a result, the photographic processing centers were not identified as AOPIs.

Table 5-1. Summary of Areas not Retained as AOPIs at FBH (Continued)

Area Description	Dates of Operation	Relevant Site History	Rationale
Photographic Processing (Buildings 1, 300, 400, 434, 470, and 479)	Unknown (active in 1992)	Used for black-and-white processing (Buildings 1, 400, 434, 470, and 479), X-ray processing (Building 300), and color processing (Building 470). Photographic wastes from Buildings 1, 434, and 470 were ultimately disposed of to the sanitary sewer through recovery units and sink drains.	No evidence that PFAS-containing materials were used, stored, or disposed of. Although products used in photographic processing have the potential to contain PFAS, no evidence (e.g., chemical inventories) obtained indicated that the specific photographic processing solutions used at FBH contained PFAS or what quantities could have been disposed of (as presented in Section 4.2.5). As a result, the photographic processing centers were not identified as AOPIs.
Carpentry Shop (Building 1)	Unknown (active in 1992)	Activities associated with carpentry, including woodworking, wood/furniture repair, and small amounts of painting and paint stripping, were conducted at the shop. Wastes such as paints, paint thinners, and paint remover were stored inside the shop in a drum on a wooden pallet and transferred to DRMO for handling and disposal.	No evidence that PFAS-containing materials were used, stored, or disposed of.
DIS Transportation Motor Pool (Building 36)	Unknown (active in 1992)	Transportation vehicle maintenance shop converted to a vehicle storage area in 1988. A drum storage area and wash rack were also present at the facility.	No evidence that PFAS-containing materials were used, stored, or disposed of.
Former 36th Engineers Maintenance Shop (Building 109)	Unknown (prior to 1992)	Typical vehicle and equipment maintenance shop operations. A drum storage area was present inside the building. Building 109 was demolished prior to 1992.	No evidence that PFAS-containing materials were used, stored, or disposed of.
U.S. Army Reserve Center (Building 127)	Unknown (active in 1992)	Conducted routine maintenance on government-owned vehicles. A waste POL drum storage area also was present outside the building. Operations included oil changing, tire and indoor battery storage, brake repair, electrical systems repair, parts cleaning/degreasing, and engine tune-ups.	No evidence that PFAS-containing materials were used, stored, or disposed of.

Table 5-1. Summary of Areas not Retained as AOPIs at FBH (Continued)

Area Description	Dates of Operation	Relevant Site History	Rationale
Roads and Grounds Department (Building 422)	Unknown (active in 1992)	Performed routine maintenance of landscaping and roadwork equipment, including degreasing, battery storage, and battery servicing (i.e., replacement of electrolyte fluids). Previous waste accumulation areas were present within and outside the building and included hazardous substances and wastes and POL wastes. A vehicle wash rack also existed outside the building for equipment washing. Two floor drains within the building discharged to the sanitary sewer.	No evidence that PFAS-containing materials were used, stored, or disposed of.
Office Equipment/Vehicle Maintenance Shop (Building 424)	Unknown (active in 1992)	Used for office equipment repairs in 1992; however, formerly used for typical vehicle maintenance operations. Waste oil, solvents, paint stripper, used battery electrolyte, used petroleum naphtha, used solvents, and paint sludge were historically stored in the building.	No evidence that PFAS-containing materials were used, stored, or disposed of.
Vehicle Maintenance Shop (Buildings 425 and 426)	Unknown (prior to 1992)	Used for typical vehicle maintenance operations and later converted for supplies storage (e.g., office supplies, clothing, mattresses, bedding). The concrete floor in the building had several floor drains that discharged to the sanitary sewer.	No evidence that PFAS-containing materials were used, stored, or disposed of.
Former Gas Station/Oil House (Building 13)	1919 to unknown	Operations included dispensing heating oil (1919 to 1937), dispensing gasoline (began in 1937), and vehicle maintenance. Reported to have been demolished prior to 1992.	No evidence that PFAS-containing materials were used, stored, or disposed of.
Former PX Gas Station (Building 619)	Unknown (prior to 1992)	Previously used as a gas station and potentially vehicle maintenance operations. Later used for administrative purposes (Weston 1992). No records were found pertaining to spills, leaks, or releases of petroleum products, and historical operations are not detailed (SAIC 1998).	No evidence that PFAS-containing materials were used, stored, or disposed of.

Table 5-1. Summary of Areas not Retained as AOPIs at FBH (Continued)

Area Description	Dates of Operation	Relevant Site History	Rationale
Auto Craft Shop (Building 705)	Unknown (active in 1992)	Self-help auto craft shop for Army personnel to work on their personal vehicles. A wash rack with floor drains inside the building drained to an OWS. In the past, waste oil was stored in a drum accumulation area inside the building and later in a UST outside the building (Weston 1992).	No evidence that PFAS-containing materials were used, stored, or disposed of.
Former Paint Shop (Building 38)	1938 to unknown	Constructed for use as a paint shop and later used as a community center.	No evidence that PFAS-containing materials were used, stored, or disposed of.
Wash Racks (Buildings 36, 127, 128, 422, 423, 424, 425, 426, 500, 515, 536, and 705)	Varied	Outdoor wash racks at Building 36, 127 (three), 422, 425/426, 500, 515, and 536. Indoor wash racks at Buildings 127, 128, 423, 424, and 705. Unreported amounts of oil, grease, engine fluids, and solvents could have contaminated the soil and/or surface water bodies near or around the wash racks, grease racks, and OWS located at Buildings 4, 36, 109, 116, 117, 127, 128, 422-426, 500, 515, 536, and 705.	No evidence that PFAS-containing materials were used in the wash racks at FBH. No evidence that emergency vehicles with AFFF were washed.
POL Drum Accumulation Areas/ POL Waste Staging (Buildings 34, 36, 109, 116, 127, 422, 424, and 705)	Varied	Materials stored include oil, gasoline, other petroleum products, hydraulic fluids, transmission fluids, brake fluids, antifreeze, and solvents. Generated wastes include waste oil and greases, spent engine fluids, spent solvents, brake shoes and linings, and lead and acid from batteries.	No evidence that PFAS-containing materials were used, stored, or disposed of.
POL Service Station (Building 239)	Unknown (active in 1992)	Fueling station that distributed leaded and unleaded gasoline and diesel fuel to Government-owned vehicles.	No evidence that PFAS-containing materials were used, stored, or disposed of.
DIS Engineering/Maintenance Building (Building 26, formerly located at Building 108)	Unknown (active in 1992)	Storage of paint, paint thinners, and solvents. Although no major spills were reported, this site was sampled during the Phase I and Phase II EIs. Metals, VOCs, pesticides, and herbicides were detected in environmental media. The Phase II EI recommended NFA (SAIC 1998).	No evidence that PFAS-containing materials were used, stored, or disposed of.
Former Drum Storage (South of Buildings 45 and 46)	Unknown (prior to 1938 to 1980s)	Drummed waste materials stored outside in grassy area. PCB transformers also stored in the location prior to 1981. A paint shop was located in the area and was destroyed by a fire. Details of the fire (i.e., date of occurrence and emergency response activities) are not available.	No evidence that PFAS-containing materials were used, stored, or disposed of.

Table 5-1. Summary of Areas not Retained as AOPIs at FBH (Continued)

Area Description	Dates of Operation	Relevant Site History	Rationale
Former Drum Storage (South of Buildings 45 and 46)	Unknown (prior to 1938 to 1980s)	Drummed waste materials stored outside in grassy area. PCB transformers also stored in the location prior to 1981. A paint shop was located in the area and was destroyed by a fire. Details of the fire (i.e., date of occurrence and emergency response activities) are not available.	No evidence that PFAS-containing materials were used, stored, or disposed of.
DRMO Hazardous Waste Storage Area (Buildings 124 and 125)	Unknown (active in 1992)	Indoor and outdoor storage and disposal facility for hazardous waste, including waste oils, paints, solvents, and batteries (stored outdoors).	No evidence that PFAS-containing materials were used, stored, or disposed of.
Pesticide Mixing and Storage Area (Building 27)	1970s	Boiler room/shed with concrete floors. Basement has flooded several times since storage activities (Weston 1992). The Phase II EI (SAIC 1998) recommended NFA due to low concentrations of pesticides detected.	No evidence that PFAS-containing materials were used, stored, or disposed of. Based on the period of operation for FBH, the dates of pesticide use at the facility pre-date the use of fluorinated pesticides.
Pesticide Mixing and Storage (Building 514)	Unknown to middle to late 1980s	Used for pesticide mixing, temporary pesticide storage, and pesticide application equipment storage (Weston 1992). The Phase II EI (SAIC 1998) recommended NFA due to low concentrations of pesticides detected.	No evidence that PFAS-containing materials were used, stored, or disposed of. Based on the period of operation for FBH, the dates of pesticide use at the facility pre-date the use of fluorinated pesticides.
DIS Entomology Pesticide Storage and Mixing (Buildings 604 and 605)	Unknown (active in 1992)	Pesticide, herbicide, insecticide, and rodenticide storage and mixing indoors and outdoors. Empty pesticide-related containers were disposed of in the sanitary landfill without rinsing from 1970 to 1980. Past sampling indicated pesticide releases to Hawthorne Lake (Weston 1992). The Phase II EI recommended surface soil removal at the two drainage areas north and northeast of Building 605 due to elevated pesticide concentrations (SAIC 1998).	No evidence that PFAS-containing materials were used, stored, or disposed of. Based on the period of operation for FBH, the dates of pesticide use at the facility pre-date the use of fluorinated pesticides.
Golf Course (Building 674)	1970 to 1980	Pesticide storage in shed adjacent to Building 674 and mixing outside building (Weston 1992). The Phase II EI recommended surface soil removal in two locations due to elevated pesticide concentrations (SAIC 1998).	No evidence that PFAS-containing materials were used, stored, or disposed of. Based on the period of operation for FBH, the dates of pesticide use at the facility pre-date the use of fluorinated pesticides.

Table 5-1. Summary of Areas not Retained as AOPIs at FBH (Continued)

Area Description	Dates of Operation	Relevant Site History	Rationale
Building 810 WWTP	Unknown to November 1980	Treated sanitary wastewater associated with post operations, including fixative photographic solution wastes, waste xylol and acetone, and ammonia-containing blueprint solution. OWS associated with vehicle maintenance facilities and wash racks may have drained to the WWTP. Effluent was discharged after treatment to Fall Creek under an NPDES permit. The WWTP was closed in 1980 and the sludge was disposed of in an unidentified sanitary landfill. The WWTP received waste oil, pesticides, photographic fixative solution, solvents, and petroleum products directly or through the sewer system. No evidence was found to determine whether these chemicals contained PFAS. During the 1992 investigation, it was unknown whether the WWTP had a lined base; however, documentation suggests that the treatment tanks were lined with clay and filled with 2-inch crushed limestone prior to use as an FTA (Weston 1992). In addition, drums containing lithium bromide and possibly pesticides were potentially buried adjacent to Building 810. Sampling conducted under RCRA identified metals, VOCs, SVOCs, PCBs, pesticides, herbicides, and TPH in environmental media. The Phase II RCRA facility investigation recommended NFA based on the HHRA and ERA (HLA 1998). Based on aerial photography, the structures associated with the WWTP appear to have been demolished prior to 1985.	No evidence that the WWTP received waste from PFAS AOPIs.
Former STP (West of Building 674)	1913 to 1971	No operational records located for this WWTP; however, the facility potentially received waste oil, pesticides, photographic fixative solution, solvents, and petroleum products similar to the STP (Weston 1992). The Phase II EI (SAIC 1998) recommended an FFS for the former sludge drying beds due to elevated lead concentrations in soil.	No evidence that the former STP received waste from PFAS AOPIs. Operational time frame prior to widespread PFAS use (1972).

Table 5-1. Summary of Areas not Retained as AOPIs at FBH (Continued)

Area Description	Dates of Operation	Relevant Site History	Rationale
Former STP East Area of FBH (North of Building 509)	1913 to 1951	No operational records were located for this WWTP; however, the potential exists that the facility received waste oil, pesticides, photographic fixative solution, solvents, and petroleum products similar to the STP (Weston 1992). The Phase II EI (SAIC 1998) recommended NFA; however, the WWTP likely received wastewater from former operations that had PFAS-containing materials.	No evidence that the former STP received waste from PFAS AOPIs. Operational time frame prior to widespread PFAS use (1972). Although products used in photographic processing have the potential to contain PFAS, no evidence (e.g., chemical inventories) obtained indicated that the specific photographic processing solutions used at FBH contained PFAS or what quantities could have been disposed of (as presented in Section 4.2.5). As a result, the photographic processing centers were not identified as AOPIs.
East Landfill	1940 to 1968	Wastes included office and household wastes, demolition and construction debris, tree trimmings, and ash from incinerator operations. Used oil, solvents, pesticides, and paints could have been disposed of in the landfill.	No evidence that the landfill received PFAS-containing materials from the identified AOPIs. Operational time frame prior to widespread PFAS use (1972).
West Landfill	1936 to 1991	Thirty-acre landfill that received office and household wastes, tires, ash from the boiler plant, autoclave wastes from the hospital, demolition and construction debris, and tree trimmings. Potential for used oils, solvents, pesticides, and paints also could have been disposed of in the landfill. Unrinsed pesticide containers were disposed of in the landfill between 1970 and 1980. In 1980, sludge from the Building 810 WWTP was reportedly disposed of in a sanitary landfill, and the timeline suggests that the West Landfill was the primary landfill in operation at that time. The landfill cover was deemed inadequate, and evidence was found of leachate seepage due to poorly compacted cover. Topography in this area allowed ravines to feed to Lawrence and Fall Creeks.	No evidence that the landfill received PFAS-containing materials from the identified AOPIs. While monitoring wells currently exist at the West Landfill, there is no evidence that the landfill definitively received PFAS-containing materials.

Table 5-1. Summary of Areas not Retained as AOPIs at FBH (Continued)

Area Description	Dates of Operation	Relevant Site History	Rationale
Historical Military Sites	Varied	Multiple dumps/landfills at historical sites with ranging dates of operations (HLA 1993). The Phase II EI recommended NFA for all of the historical military sites due to low concentrations of landfill constituents.	No evidence that the landfills received PFAS-containing materials from the identified AOPIs. Operational time frames prior to widespread PFAS use (1972).
Former Fire Training Area (North of Building 518)	1945 to 1956	Training conducted to the west of the closed landfill (east). Activities consisted of three training periods annually with three fires per training period, each with 20 gallons of fuel oil, which was ignited in large metal troughs. The remaining oil was allowed to burn off.	Operational time frames prior to widespread AFFF use (1972). Records do not specify the methods of extinguishing the fires; however, PFAS was not considered a concern because this site was in operation prior to the widespread use of AFFF.
Natural Gas Explosion and Fire at Harrison Village Apartment Complex	December 9, 1990	A gas system valve malfunction allowed natural gas to enter residential buildings. Gas accumulating in a building was ignited by one of many available sources, such as electrical switches and appliances, and resulted in an explosion.	Based on anecdotal evidence by the Lawrence Fire Department Chief, AFFF would not have been used for this type of fire response. In addition, the Pipeline Accident Report did not specify the use of foam.
Patriotic SWMU	1992	A burn pit was constructed for a single episode of flag decommissioning by burning. Diesel fuel was applied to the flags, allowed to burn off, and the pit was then backfilled with clean soil.	No fire response or AFFF use reported.
Helipad	Unknown	Building 1 Helipad that served the Army Finance Center.	No crashes or AFFF releases reported.
FBH Hospital Helipad	Unknown through approximately 2012	Helipad serving the Army Hospital.	No crashes or AFFF releases reported.

5.2 AOPIs

Based on analysis of information obtained during document research, personnel interviews, and/or site reconnaissance, six areas were categorized as AOPIs, as presented in Table 5-2. Site research conducted for this PA indicates that PFAS-containing material use, storage or disposal is potentially suspected at these areas.

Table 5-2. Summary of AOPIs at FBH

Area Description	Dates of Operation	Relevant Site History	Rationale
Building 810 FTA	1980 to 1995	Fire training exercises were conducted by igniting fuel on old car bodies or in 55-gallon drum halves partially filled with water. It is unknown how the fire was extinguished.	Fire training activities conducted with unknown materials. The FBH Fire Department used foam on-post and may have used the foam for training activities. It is unknown whether foam contained PFAS.

Table 5-2. Summary of AOPIs at FBH (Continued)

Area Description	Dates of Operation	Relevant Site History	Rationale
West Landfill FTA	1941 to mid-1970s	The West Landfill FTA was used during the operational period where foam may have contained PFAS. Fuel was placed in a trough and for firefighting activities several times per year. It is unknown how the fire was extinguished.	Fire training activities conducted with unknown materials. The FBH Fire Department used foam on-post and may have used the foam for training activities. It is unknown whether foam contained PFAS.
Fire Station No. 2 FTA	Unknown	Interview with the city of Lawrence Fire Chief indicated that fire training activities occurred across the street (south/southeast) from Fire Station No. 2. The frequency and type of materials used as part of training is unknown.	
Army and Air Force Exchange System Gas Station at Building 33	Unknown to FBH closure (1995)	Operated as a base gas station and maintenance for private vehicles. Several spills were documented to have occurred at the facility.	Spills in the 1980s were documented to be cleaned up with a foam applied by the FBH Fire Department. It is unknown whether the foam contained PFAS.
Fire Station No. 1	Unknown to FBH closure (1995)	Building 624 (fire station) and Building 623 (fire hose house) used by Post Fire Department. A 1,000-gallon AST was present at Building 624; however, no documents indicated the contents of the AST.	Due to the documented use of foam on-post by the FBH Fire Department it was likely stored at the fire department/ on fire equipment for emergency response. It is unknown whether the foam contained PFAS, but it was present at the time fluoro-chemical foam was used.
Fire Station No. 2	Unknown to FBH closure (1995)	Building 116 was the location of the 36th Engineers Maintenance Shop prior to its use as a fire station. Dates marking the change of use are unknown. A former grease rack may have been present to the northwest of the building. A storm sewer drain was observed in front of the middle bay of the fire station in 1992 and may have been used as a wash rack.	

5.2.1 Preliminary CSM

A preliminary CSM was prepared for each of the Installation's AOPIs in accordance with the USACE Engineer Manual on Conceptual Site Models, EM 200-1-12 (USACE 2012) and USEPA guidance. The preliminary CSMs identified potential human receptors and chemical exposure pathways based on current and/or reasonably anticipated future land uses. The preliminary CSMs identified soil, groundwater, surface water, and sediment pathways as potentially complete.

Based on the documented or potential historical use, storage, or release of PFAS-containing materials at FBH, affected media are likely to consist of soil, groundwater, surface water, and sediment. Release and transport mechanisms include dissolution/desorption from soil to groundwater, runoff/dissolution/adsorption with surface water or stormwater, and recharge to groundwater from surface water. While other potential exposure media (i.e., soil and sediment) besides drinking water sources (i.e., groundwater and/or surface water) may be impacted by PFAS, direct ingestion via drinking water is

the most likely exposure route, and thus the Army's primary concern for human exposure. Therefore, the focus of the Army's PA program is on potential human exposures via drinking water ingestion. The potential for human exposures to PFAS through non-drinking water pathways has not yet been established and may be evaluated in the future if it is determined that those pathways warrant further consideration. The CSMs presented in this report focus on drinking water pathways via groundwater and surface water that are known to be used as a source of potable water.

A groundwater exposure pathway is considered potentially complete where COIs could migrate from the AOPI source area to groundwater that is used for drinking water. Otherwise, the groundwater exposure pathway is considered incomplete. The following parameters are used to determine if an AOPI source area had a potentially complete groundwater exposure pathway:

- AOPIs located upgradient or in the vicinity of drinking water sources and that have the potential to influence groundwater associated with these potable sources are considered to have a potentially complete groundwater exposure pathway for on-post drinking water receptors.
- AOPIs that have the potential to influence groundwater that flows off-post are considered to have a potentially complete exposure pathway for off-post receptors.

The soil exposure pathway is considered potentially complete where COIs could be present in soil. A surface water exposure pathway is considered potentially complete where COIs could be present in a surface water body (e.g., a reservoir or large river) that serves as a potable water source.

Figure 5-1 presents the locations of the AOPIs. AOPI-specific CSM summaries are provided in Tables 5-3 through 5-8.

5.2.2 Building 810 FTA Rationale and CSM

The Building 810 FTA (Figure 5-1) was identified as an AOPI following records reviews, interviews, aerial photograph review, and site reconnaissance. AFFF was potentially used during fire training activities given the period of operation of the FTA.

The Building 810 FTA was located adjacent to Building 810 on the southern side of Shafter Road in the northern portion of FBH. Prior to use as an FTA, the area was the location of the Building 810 WWTP and the site of suspected buried lithium bromide drums that may have contained pesticides. In 1980, the WWTP was closed and the former sedimentation tank areas and other locations within the fenced area were used for fire training (HLA 1998). Fire training exercises were conducted by igniting fuel on old car bodies or in 55-gallon drum halves partially filled with water, which were placed on top of the old treatment tanks. According to site personnel interviews conducted during the 1992 USATHAMA Enhanced PA (Weston 1992), the fuel was consumed during burning, and little to no drainage of fuel from the area occurred.

Four monitoring wells were installed near the WWTP in April 1990. Dissolved metals (barium, iron, lead, lithium, manganese, sodium, and zinc) were detected in the groundwater samples collected from the monitoring wells. Fuels, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs) were not detected. Two additional monitoring wells were installed as part of the Phase I and Phase II RCRA Facility Investigations at the WWTP. Surface soil, subsurface soil, excavation soil, sediment, and groundwater samples were collected as part of the investigations. Metals, VOCs, SVOCs, polychlorinated biphenyls (PCBs), pesticides, herbicides, and total petroleum hydrocarbons (TPH) were detected in soil and sediment samples. Metals, VOCs, SVOCs, and pesticides were detected in groundwater samples. Two metals (sodium and lead) exceeded background concentrations in surface and subsurface soil samples, respectively. Sodium concentrations were also elevated in downgradient groundwater samples. Based on the human health risk assessment (HHRA), concentrations of constituents detected at the WWTP did not pose a significant health risk, and the Army recommended no further action (NFA) at the site (HLA 1998).

The exact dates of operation for the WWTP and FTA are unknown; however, the WWTP was closed in 1980 and the FTA was likely active from 1980 until 1995. The Building 810 FTA was part of 1,393 acres transferred to the State of Indiana in 2011 and is now part of the Fort Harrison State Park (U.S. Army 2020). No restrictions were placed on land use as part of transfer. Based on visual inspection of the FTA during the site visit, the area is primarily well-maintained grass that is level with Shafter Road to the north and a slope that increases in elevation toward the tree line to the south. No structures are present at the Building 810 WWTP.

Table 5-3. AOPI CSM Information Profile – Building 810 FTA

Profile Type	Information Needs	Preliminary Assessment Findings
Site Profile	AOPI site structures/description	Well-maintained/grassy field on a slope with increasing elevation from the road to the north to the south toward a tree line.
	Latitude, longitude	39.8586657, -86.02583251
	Size	2.53 acres
	Local Parcel Number	4038409
Land Use	Current/future land use	Recreational
CSM Profile	Source media	Soil
	Migration routes/release mechanisms	Constituents could migrate from soil to groundwater via desorption and dissolution. Constituents could migrate to surface water due to runoff, dissolution, and adsorption from stormwater and recharge to groundwater from surface water.
	Exposure pathways, media, and human receptors	Potential soil exposure exists at the site. Potential potable use of groundwater underlying the Building 810 FTA is unlikely. Shallow groundwater within this area flows north/northwest toward Fall Creek and surface water eventually drains to Fall Creek. Drinking water for Indianapolis is partially drawn from surface water intakes along Fall Creek downgradient from FBH. Therefore, a potential complete exposure pathway exists for off-post human receptors. No known potable wells exist downgradient from the site.

5.2.3 West Landfill FTA Rationale and CSM

The West Landfill FTA (Figure 5-1) was identified as an AOPI following records reviews, interviews, aerial photograph review, and site reconnaissance. AFFF was potentially used during fire training activities given the suspected period of operation of the FTA.

The West Landfill FTA was located to the east of the West Landfill. Activities consisted of burning 10 to 20 gallons of fuel oil ignited in a large metal trough two or three times per training period with three periods annually. The remaining fuel was recorded to have been allowed to burn off (Weston 1992).

The dates of operation are unknown. However, based on the aerial photographic analysis, the area shown in the 1992 USATHAMA Enhanced PA (Weston 1992) correlates with an area on the eastern side of the West Landfill that appears to be cleared of brush and trees from 1941 until the mid-1970s. The West Landfill FTA is situated on property retained by the U.S. Government for the West Landfill and presently includes no use restrictions. The easternmost boundary of the West Landfill FTA may be part of 1,393 acres transferred to the State of Indiana in 2011 and is now part of the Fort Harrison State Park (U.S. Army 2020). Based on visual inspection of the FTA during the site visit, the area is heavily wooded. A generally east-west trending access path extends from the West Landfill to the Fort Harrison State Park horse pasture and stables to the east. A small stream runs southeast-northwest between the West Landfill and the West Landfill FTA.

Table 5-4. AOPI CSM Information Profile – West Landfill FTA

Profile Type	Information Needs	Preliminary Assessment Findings
Site Profile	AOPI site structures/description	Heavily wooded area on a gradual slope that decreases from east to west toward a southeast-northwest trending stream.
	Latitude, longitude	39.85970542, -86.02406167
	Size	2.83 acres
	Local Parcel Number	4038399
Land Use	Current/future land use	Recreational
CSM Profile	Source media	Soil
	Migration routes/release mechanisms	Constituents could migrate from soil to groundwater via desorption and dissolution. Constituents could migrate to surface water due to runoff, dissolution, and adsorption from stormwater and recharge to groundwater from surface water.
	Exposure pathways, media, and human receptors	Potential soil exposure exists at the site. Potential potable use of groundwater underlying the West Landfill FTA is unlikely. Shallow groundwater within this area flows northwest toward a tributary to Schoen Creek and surface water eventually drains to Fall Creek. Drinking water for Indianapolis is partially drawn from surface water intakes along Fall Creek downgradient from FBH. Therefore, a potential complete exposure pathway exists for off-post human receptors. No known potable wells exist downgradient from the site.

5.2.4 Army and Air Force Exchange System Gas Station Rationale and CSM

The Army and Air Force Exchange System (AAFES) Gas Station was identified as an AOPI following records reviews, interviews, aerial photograph review, and site reconnaissance. Records indicate that a foam agent was used for mitigating a gasoline spill at the gas station. Given the period of the occurrence, the foam agent used during the emergency response was likely AFFF. In addition, two spills were flushed with an unidentified substance. AFFF potentially also was used in areas of these spills.

The AAFES Gas Station was located at Building 33 on the corner of Hawkins and Birtz Roads. Gasoline was stored in underground storage tanks (USTs) and sold to private vehicle owners. Several spills occurred at the AAFES Gas Station during operation. Two gasoline spills, one on August 5 and the second on October 25, 1979, released 15 and 10 gallons of gasoline due to a failure of the float vent valve on the vapor recovery system. At the direction of the Post Fire Department, the areas of the spills were flushed. On November 5, 1988, foam was applied to a gasoline spill at the AFFES Gas Station and runoff from the road was diked with sand. Spill Recovery of Indiana conducted the cleanup, and estimated that 100 gallons were recovered (Weston 1992). On December 6, 1988, a line was broken during digging operations, releasing 20 to 50 gallons of gasoline. Sand was dumped for diking purposes, the FBH Fire Department applied foam as a precaution, and all material was recovered with a vacuum truck. It is unknown whether the foam used at the site contained PFAS. The USTs were removed in 1995 as part of base closure activities, and removal and environmental sampling activities were documented in the Building 33 Closure Report.

The Building 33 gas station was part of property transfers to FHRA for mixed ownership. No restrictions were placed on land use as part of transfer. FHRA sold the property to the Lawrence Village Senior Residence, LLC in 2010. It is currently zoned for dwellings and defined as commercial land use with environmental limitations on the property. A visual inspection was conducted of the former gas station during the site visit. The gas station has been demolished and is currently an apartment complex. Original storm drainage features are present (i.e., manholes and curbside catch basins), and surface drainage pathways generally flow east to west. The storm drainage pipes discharge to an outfall to the west of the AOPI where the drainage feeds an open space of lower elevation. A scenic boardwalk with abundant plant growth is present in the area where the outfall drains, and the drainage proceeds northwest.

Table 5-5. AOPI CSM Information Profile – AAFES Gas Station

Profile Type	Information Needs	Preliminary Assessment Findings
Site Profile	AOPI site structures/description	Apartment building surrounded by roads and asphalt parking lots that gently slope from east to west. Stormwater drainage pathways also flow east to west to an open ditch west of the site.
	Latitude, longitude	39.85838546, -86.0084503
	Size	1.58 acres
	Local Parcel Number	4045047
Land Use	Current/future land use	Commercial
CSM Profile	Source media	Paved surfaces
	Migration routes/release mechanisms	Constituents could migrate to stormwater or surface water due to runoff from paved surfaces. Constituents could migrate to soil or sediment via runoff and adsorption upon entering the unlined ditch. Constituents could migrate to groundwater through cracks in the pavement or through stormwater or surface water entering the unlined ditch via recharge to groundwater from surface water.
	Exposure pathways, media, and human receptors	Potential soil exposure exists at the site. Potential potable use of groundwater underlying the AAFES is unlikely. Shallow groundwater within this area flows west. Stormwater also flows west to a tributary, eventually draining to Fall Creek. Drinking water for Indianapolis is partially drawn from surface water intakes along Fall Creek downgradient from FBH; therefore, a potential complete exposure pathway exists for off-post human receptors. No known potable wells exist downgradient from the site.

5.2.5 Fire Station No. 2 FTA Rationale and CSM

The Fire Station No. 2 FTA (Figure 5-1) was identified as an AOPI following records reviews, interviews, and aerial photograph review. Site reconnaissance could not be performed at the AOPI due to access restrictions. AFFF was potentially used during fire training activities given the suspected period of operation of the FTA.

The Fire Station No. 2 FTA was identified during an interview with the Lawrence Fire Department. The chief indicated that based on recollections of a former colleague, the area to the east and southeast of Building 107 (across the street from Building 116, the location of Fire Station No. 2) was used by the Army Fire Department for fire training activities. The frequency of fire training activities and the amount and type of materials used were unknown (Lawrence Fire Department 2021).

The PA team was unable to access the FTA during the site visit to perform a detailed visual inspection as it was unknown the FTA is part of a secure facility associated with the U.S. Army Reserve Enclave. The area was able to be viewed from the perimeter fence and it was confirmed that it remains an open grassy area. The area remains owned by the U.S. Government and is now operated as a military installation and recruiting office for the U.S. Army Reserve and a veterans' center for the Navy Operation Support Center (NOSC). Aerial photographic evidence and geographic information system data interpretations were used to assist in developing the CSM.

Table 5-6. AOPI CSM Information Profile – Fire Station No. 2 FTA

Profile Type	Information Needs	Preliminary Assessment Findings
Site Profile	AOPI site structures/description	Well-maintained/grassy field on a slope with decreasing elevation from the northwest toward the southeast.
	Latitude, longitude	39.85937429, -85.99253295
	Size	0.54 acres
	Local Parcel Number	4003654

Table 5-6. AOPI CSM Information Profile – Fire Station No. 2 FTA (Continued)

Profile Type	Information Needs	Preliminary Assessment Findings
Land Use	Current/future land use	Industrial
CSM Profile	Source media	Soil
	Migration routes/release mechanisms	Constituents could migrate from soil to groundwater via desorption and dissolution. Constituents could migrate to surface water due to runoff, dissolution, and adsorption from stormwater and recharge to groundwater from surface water.
	Exposure pathways, media, and human receptors	Potential soil exposure exists at the site. Potential potable use of groundwater underlying the Army Reserve is currently an incomplete pathway. Shallow groundwater within this area flows north/northwest. No known potable wells exist downgradient from the site. Surface water and/or stormwater migration routes are not apparent at the site. Therefore, a complete exposure pathway for human receptors is unlikely.

5.2.6 Fire Station No. 1 Rationale and CSM

Fire Station No. 1 (Figure 5-1) was identified as an AOPI following records reviews that documents the FBH Fire Department used foam during response activities to spills. It is unknown whether the foam referenced in spill documents contained PFAS, but AFFF used during the period of operation likely contained PFAS. It is unknown where foam was stored, but it was likely stored at the fire station and/or on the fire truck for emergency response operations. Fire Station No. 1 was transferred to FHRA for mixed use. No restrictions were placed on land use as part of transfer. FHRA sold the property to Alternative Health Enterprise, LLC. It is currently zoned for dwellings and defined as commercial land use.

Table 5-7. AOPI CSM Information Profile – Fire Station No. 1

Profile Type	Information Needs	Preliminary Assessment Findings
Site Profile	AOPI site structures/description	Commercial building surrounded by buildings and asphalt parking lots that gently slope from west to east. A stormwater ditch exists east of the site.
	Latitude, longitude	39.8614409, -86.0147178
	Size	0.35 acres
	Local Parcel Number	4039587
Land Use	Current/future land use	Commercial
CSM Profile	Source media	Paved surfaces
	Migration routes/release mechanisms	Constituents could migrate to stormwater or surface water due to runoff from paved surfaces. Constituents could migrate to soil or sediment via runoff and adsorption upon entering the unlined ditch. Constituents could migrate to groundwater through cracks in the pavement or through stormwater or surface water entering the unlined ditch via recharge to groundwater from surface water.
	Exposure pathways, media, and human receptors	Potential soil exposure exists at the site. Potential potable use of groundwater underlying the Fire Station No. 1 is unlikely. Shallow groundwater within this area flows west. Stormwater also flows west to a tributary, eventually draining to Fall Creek. Drinking water for Indianapolis is partially drawn from surface water intakes along Fall Creek downgradient from FBH; therefore, a potential complete exposure pathway exists for off-post human receptors. No known potable wells exist downgradient from the site.

5.2.7 Fire Station No. 2 Rationale and CSM

Fire Station No. 2 at Building 116 (Figure 5-1) was identified as an AOPI following records reviews that documents the FBH Fire Department used foam during response activities to spills. It is unknown whether the foam referenced in spill documents contained PFAS, but AFFF used during the period of operation likely contained PFAS. It is unknown where foam was stored, but it was likely stored at the fire station and/or on the fire truck for emergency response operations. Building 116 was built in approximately 1941 based on aerial imagery. The original purpose of Building 116 and starting date of operation of Fire Station No. 2 are unknown. Fire Station No. 2 was retained by the Army for the U.S. Army Reserve Enclave; however, Fire Station No. 2 was not used past FBH closure. Building 116 is still present at the U.S. Army Reserve Enclave.

Table 5-8. AOPI CSM Information Profile – Fire Station No. 2

Profile Type	Information Needs	Preliminary Assessment Findings
Site Profile	AOPI site structures/description	Well-maintained/grassy field surrounded by buildings/pavement.
	Latitude, longitude	39.860078, -85.992584
	Size	0.2 acres
	Local Parcel Number	4002010
Land Use	Current/future land use	Industrial
CSM Profile	Source media	Soil
	Migration routes/release mechanisms	Constituents could migrate from soil to groundwater via desorption and dissolution. Constituents could migrate to surface water due to runoff, dissolution, and adsorption from stormwater and recharge to groundwater from surface water.
	Exposure pathways, media, and human receptors	Potential soil exposure exists at the site. Potential potable use of groundwater underlying the Army Reserve is currently an incomplete pathway. Shallow groundwater within this area flows north/northwest. No known potable wells exist downgradient from the site. Surface water and/or stormwater migration routes are not apparent at the site. Therefore, a complete exposure pathway for human receptors is unlikely.

5.3 DATA LIMITATIONS

The data limitations relevant to the development of this PA for PFAS at FBH are discussed below.

A comprehensive well survey was not completed as part of this PA; therefore, the information reviewed regarding off-post wells is limited. The EDR well search report (Appendix G) and online databases (Indiana DNR 2021) were referenced when identifying potential off-post drinking water receptors.

The searches for ecological receptors and off-post PFAS sources were limited to easily identifiable and readily available information. An online database was referenced when identifying the ecological profile for the site (USFWS 2021).

Records reviewed during the PA process were limited in information regarding PFAS-containing materials, including AFFF use, procurement records, and firefighter training records. Generally, interviews are crucial to understanding past practices and identifying the potential for use, storage, or disposal of PFAS-containing materials because records are often not available after installation closure. Interviews providing anecdotal accounts of AFFF use (and therefore likely PFAS release) were limited at FBH due to the length of time that the Installation has been closed under BRAC. In absence of AFFF documentation, the PA was conducted through observation of operational periods, site usage, aerial photographs, records reviews, anecdotal evidence, and personnel interviews to evaluate the use, storage, or disposal of PFAS-containing materials. Therefore, some conclusions and recommendations presented in this report are based on available information, professional judgment, and industry best practices.

6. CONCLUSIONS

This PA was conducted in accordance with DoD, Army and USEPA guidance documents. Programmatically, the Army has focused its PFAS PA efforts to identify locations where a potential for a release of PFAS exists. Locations identified on FBH with the greatest likelihood of releases of PFAS were evaluated as part of this PA, including FTAs, AFFF storage locations, aircraft crash sites, fuel farms, and sites associated with aviation assets. However, other potential sources of PFAS at FBH, such as photographic processing facilities, metal plating operations, dry cleaning facilities, wash racks, and vehicle maintenance shops, were considered and have been documented in this PA. A combination of document review, Internet searches, interviews with Installation personnel, and an Installation site visit were used to identify specific areas of suspected PFAS use and disposal at FBH.

The entire FBH was assessed. Fifty-seven preliminary areas were identified and evaluated for potential use, storage, and/or disposal of PFAS-containing materials, were further refined during the PA process, and then were either identified as an area not retained for further investigation or as an AOPI. In accordance with the established process for the PA, six of the preliminary areas have been identified as AOPIs and are listed below:

- Three former firefighter training areas
  - Building 810 FTA
  - Fire Station No. 2 FTA
  - West Landfill FTA
- Two fire stations
  - Fire Station No. 1
  - Fire Station No. 2
- An emergency response/spill cleanup (AAFES Gas Station).

A site-specific CSM was developed for each AOPI based on an assessment of existing records, personnel interviews, and site reconnaissance trips. The CSMs developed for this PA did not identify the AOPIs as presently impacting on-post drinking water receptors. However, the exposure pathway for off-post drinking water receptors is potentially complete for the six AOPIs.

Given the findings of this PA, the AOPIs presented warrant further evaluation in a SI (40 CFR 300.420(C)).

7. REFERENCES

Alexandrino, D.A.M., C.M.R. Almeida, A.P. Mucha, and M.F. Carvalho. 2022. Revisiting pesticide pollution: The case of fluorinated pesticides. Environmental Pollution, 292(1). Available online at: https://doi.org/10.1016/j.envpol.2021.118315.

Audubon. 2023. Important Bird Areas Fort Harrison State Park. Accessed March 3, 2023. Available online at: https://www.audubon.org/important-bird-areas/fort-harrison-state-park.

CBBEL (Christopher B. Burke Engineering, Ltd.). 2009. *Lower Fall Creek Watershed Management Plan.* May.

CDM (CDM Federal Programs Corporation). 2003. United States Army Reserve 88th Regional Support Command, Fort Benjamin Harrison, Unites States Army Reserve Enclave, Indianapolis, Indiana, Final Baseline Environmental Survey. October.

Clark, Quinn, Moses & Clark. 1997. *Fort Benjamin Harrison Preliminary Plan Planned Unit Development.* January 30.

Designplan, Inc. 1984. Fort Harrison Reuse Plan, Prepared for The Fort Harrison Transition Task Force. December.

DOA TRADOC (Department of the Army Training and Doctrine Command). 1995. *Final Environmental Impact Statement for Fort Benjamin Harrison, Indiana Disposal and Reuse*. January.

DoD (U.S. Department of Defense). 2021. *Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program.* September 15.

DoD. 2022. *Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program.* July 6.

EDR (Environmental Data Resources). 2021. *The EDR Radius Map™ Report with GeoCheck®*. April 26, 2021.

Environmental Research, Inc. 1996. *Aerial Photographic Record-Version III, Fort Benjamin Harrison, Marion County, Indiana.* May 1.

ESE (Environmental Science and Engineering, Inc.). 1984. *U.S. Army Toxic and Hazardous Material Agency Installation Assessment of Fort Benjamin Harrison, Indiana, Report No. 331*. January.

Hankins, M. 2022. Fort Benjamin Harrison: From Military Base to Indiana State Park. Master's thesis. April. Available online at: https://scholarworks.iupui.edu/bitstream/handle/1805/22736/Hankins_Final_Masters%20Thesis_Fort_Ben.pdf?sequence=1.

HLA (Harding Lawson Associates). 1993. *Technical Sampling Plan for Fort Benjamin Harrison, RCRA Facility Investigation, Marion County, Indiana*. August 25.

HLA. 1995. *Revised Final Phase I Environmental Investigation Report, Fort Benjamin Harrison, Marion County, Indiana*. September.

HLA. 1998. *Final Phase II RCRA Facility Investigation Report, Former Fort Benjamin Harrison, Lawrence, Indiana.* August.

IDEM (Indiana Department of Environmental Management). 2021. PFAS. Accessed October 4, 2021. Available online at: https://www.in.gov/idem/resources/nonrule-policies/per-and-polyfluoroalkyl-substances-pfas/.

IDEM. 2023. IDEM PFAS Sampling Project for Community Public Water Systems Information Sheet. Accessed May 10, 2023. Available online at: https://www.in.gov/idem/files/pfas_cws_sampling_project.pdf.

Indiana DNR (Indiana Department of Natural Resources). 2021. *Water Well Record Database*. Accessed July 20, 2021. Available online at: https://www.in.gov/dnr/water/ground-water-wells/water-well-record-database/.

IGS (Indiana Geological Survey). 2021. Aquifer Recharge (Near Surface) – IGS (2015). Accessed October 1, 2021. Available online at: https://maps.indiana.edu/previewMaps/Hydrology/Aquifer_Recharge_Near_Surface.html.

ITRC (Interstate Technology Regulatory Council). 2020a. *History and use of Per- and Polyfluoroalkyl Substances (PFAS). Washington, DC.* April. Available online at: https://pfas-1.itrcweb.org/fact_sheets_page/PFAS_Fact_Sheet_History_and_Use_April2020.pdf.

ITRC. 2020b. *Per- and Polyfluoroalkyl Substances (PFAS) Fact Sheet.* Updated April 14, 2020. Available online at: https://pfas-1.itrcweb.org/4-physical-and-chemical-properties/#4_2.

ITRC. 2020c. *Aqueous Film-Forming Foam (AFFF). Washington, DC.* April. Available online at: https://pfas-1.itrcweb.org/fact_sheets_page/PFAS_Fact_Sheet_AFFF_April2020.pdf.

Kodak (Eastman Kodak Company, Health, and Environmental Laboratories). 2002. Comments on the Proposed Significant New Use Rule (SNUR) for Perfluoroalkyl Sulfonates (PFAS) Published March 11, 2002 (67 FR 11014). July 1.

Lawrence Fire Department. 2021. Communication from Lawrence Fire Department Fire Chief to Gabby Gromofsky (Leidos) during an interview. July 26.

Leidos. 2021. *Programmatic Work Plan. Preliminary Assessments of Per- and Polyfluoroalkyl Substances at Multiple BRAC Installations, Nationwide*. August.

NWI (National Wetlands Inventory). 2023. Wetlands Mapper. Accessed March 2, 2023. Available online at: https://www.fws.gov/wetlands/Data/Mapper.html.

SAIC (Science Applications International Corporation). 1995. *Transmittal of the Phase II EI Work Plan Meeting Minutes for Fort Benjamin Harrison, Marion County, Indiana.* December 8.

SAIC. 1998. *Phase II Environmental Investigation Report, Fort Benjamin Harrison, Marion County, Indiana*. August.

The Indianapolis Public Library. 2021. *Indianapolis Public Library Digital Collections.* Accessed July 7, 2021. Available online at: https://www.digitalindy.org/digital/collection/iwc.

U.S. Army. 1993. *Landfill Closure/Post Closure Plan for Fort Benjamin Harrison, Marion County, Indiana*. Prepared by ENTECH, Inc. April 26.

U.S. Army. 2018. *Army Guidance for Addressing Releases of Per- and Polyfluoroalkyl Substances*. September 4. Available online at: https://www.fedcenter.gov/admin/itemattachment.cfm?attachmentid=1150.

U.S. Army. 2020. *Legacy Base Realignment and Closure Installations Conveyance Progress Reports*. October.USA.com 2021. *Marion County, Indiana Weather*. Accessed July 7, 2021. Available online at: http://www.usa.com/marion-county-in-weather.htm.

USACE (U.S. Army Corps of Engineers). 2012. Environmental Quality, Conceptual Site Models, EM 200-1-12. December 28.

USACE. 2021. *Glenn Road (West) Landfill Post-Closure Certification Report, Former Fort Benjamin Harrison, Indianapolis, Indiana*. April.

USAEC (U.S. Army Environmental Center). 1994. *Final Phase I Environmental Investigation Report, Fort Benjamin Harrison, Marion County, Indiana.* July.

U.S. Census Bureau. 2019. *Lawrence Township, Marion County, Indiana*. Accessed July 7, 2021. Available online at: https://data.census.gov/cedsci/profile?g=0600000US1809742444.

USEPA (U.S. Environmental Protection Agency). 1991. *Guidance for Performing Preliminary Assessments Under CERCLA, EPA/540/G-91013*. September.

USEPA. 2016. *Lifetime Health Advisories and Health Effects Support Documents for Perfluorooctanoic Acid and Perfluorooctane Sulfonate*. EPA-HQ-OW-2014-0138; FRL-9946-91-OW. Federal Register/ Vol. 81. No. 101. Accessed May 25. Available online at: https://www.govinfo.gov/content/pkg/FR-2016-05-25/pdf/2016-12361.pdf.

USEPA. 2021. *Human Health Toxicity Values for Perfluorobutane Sulfonic Acid and Related Compound Potassium Perfluorobutane Sulfonate*. U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-20/345F, 2021.

USEPA. 2023. *Fifth Unregulated Contaminant Monitoring Rule*. Available online at: https://www.epa.gov/dwucmr/fifth-unregulated-contaminant-monitoring-rule.

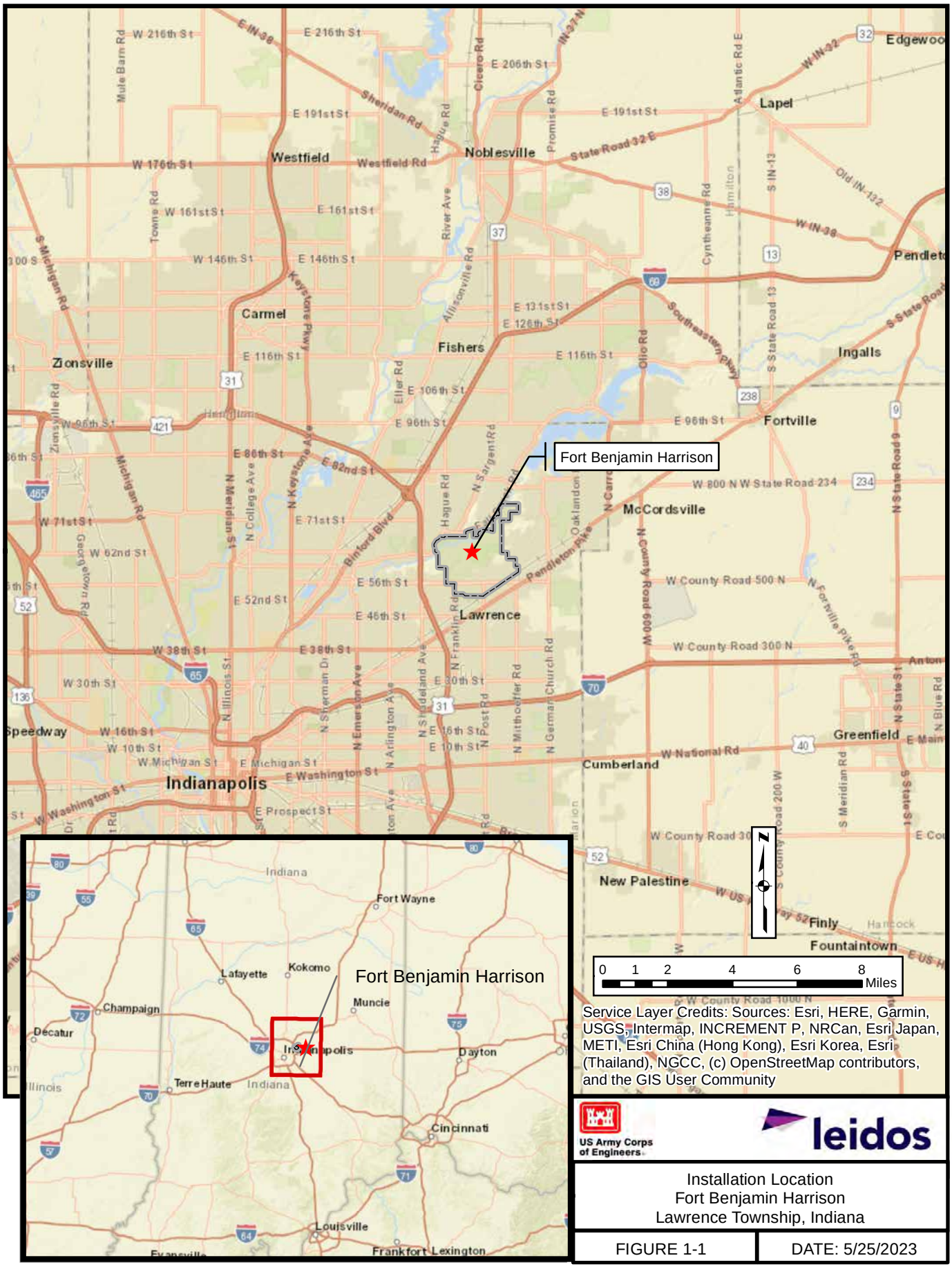
USFWS (U.S. Fish and Wildlife Service). 2021. *Endangered Species, Find Endangered Species*. Accessed on July 7, 2021. Available online at: https://www.fws.gov/endangered/?ref=topbar.

USFWS. 2023. Environmental Conservation Online System for Information for Planning and Consultation (IPaC) website. Accessed March 1, 2023. Available online at: https://ecos.fws.gov/ipac/.

USGS (U.S. Geological Survey). 1999. *Hydrogeology, Ground-water Flow, and Ground-water Quality Near the Closed East Landfill at the Former Fort Benjamin Harrison, Marion County, Indiana.* January.

Weston (Roy F. Weston, Inc.). 1992. *USATHAMA Delivery Order 9 Enhanced Preliminary Assessment, Fort Benjamin Harrison, Indiana*.

FIGURES


Fort Benjamin Harrison
Indianapolis
Carmel
Fishers
Lawrence
Westfield
Noblesville
Zionsville
McCordsville
Fortville
Ingalls
Lapel
Pendleton
Edgewood
Speedway
Greenfield
Cumberland
New Palestine
Finly
Fountaintown
Hancock
Indiana
Fort Wayne
Lafayette
Kokomo
Muncie
Champaign
Decatur
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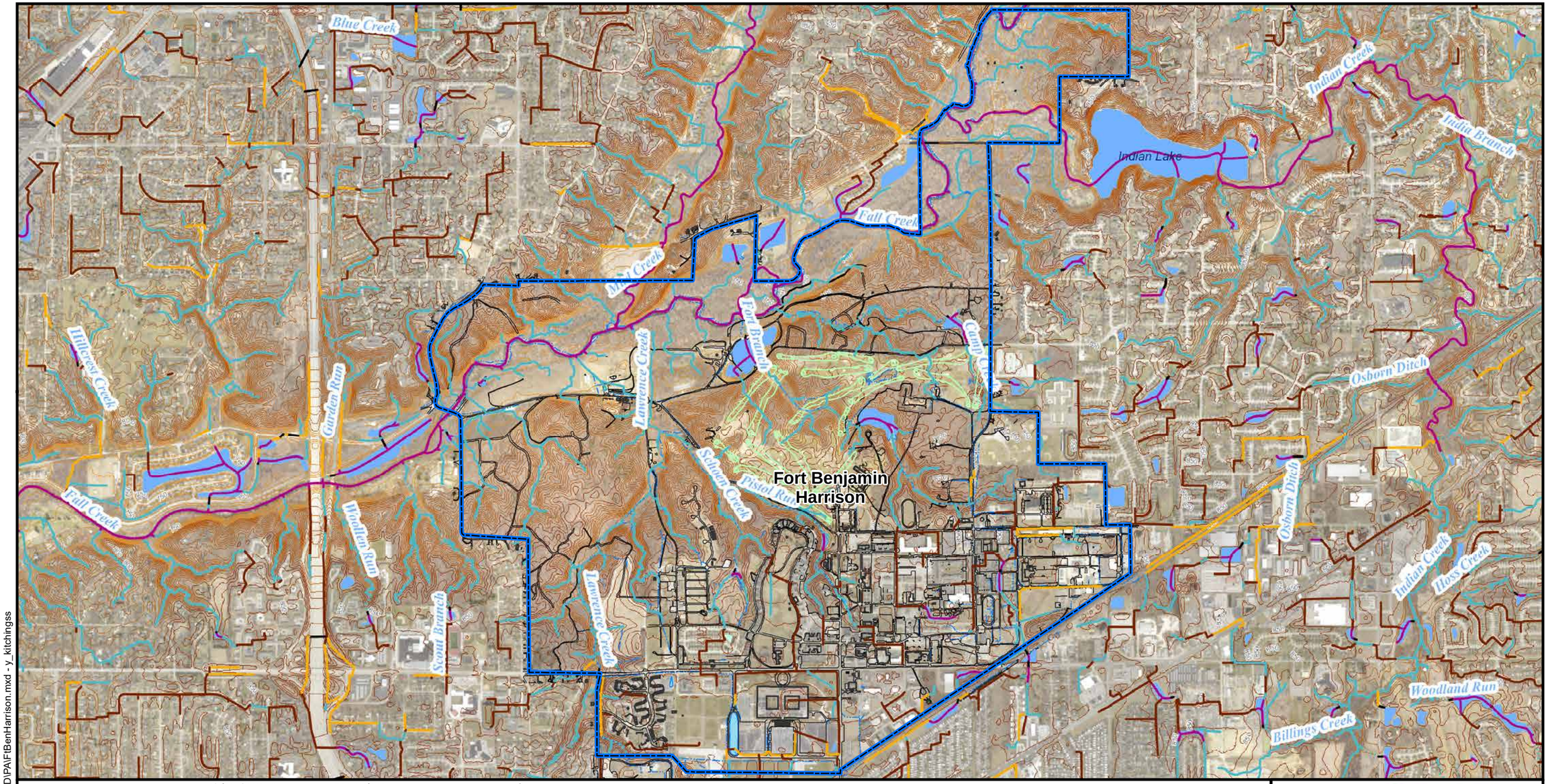
Installation Location
Fort Benjamin Harrison
Lawrence Township, Indiana
FIGURE 1-1
DATE: 5/25/2023



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Roads
Buildings
Golf Course
Surface Water Feature
Surface Water
Installation Boundary

10-foot Contours	Depressions
310 - 510	310 - 510
511 - 610	511 - 610
611 - 675	611 - 675
676 - 720	676 - 720
721 - 770	721 - 770
771 - 825	771 - 825
826 - 890	826 - 890
891 - 1250	891 - 1250

Sources:
Base map feature leidos CAD archives.
Topographic Contours USGS and Indiana DNR (https://gis.in.gov/ArcGIS/rest/services)
National Hydrography Dataset – USGS TNM (https://hydro.nationalmap.gov/arcgis/rest/services)
2021 Aerial Photography State of Indiana (https://xmaps.indy.gov/arcgis/services)

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SCALE: 1" = 2,000'

IN STATE PLANE EAST (NAD83)

US Army Corps of Engineers
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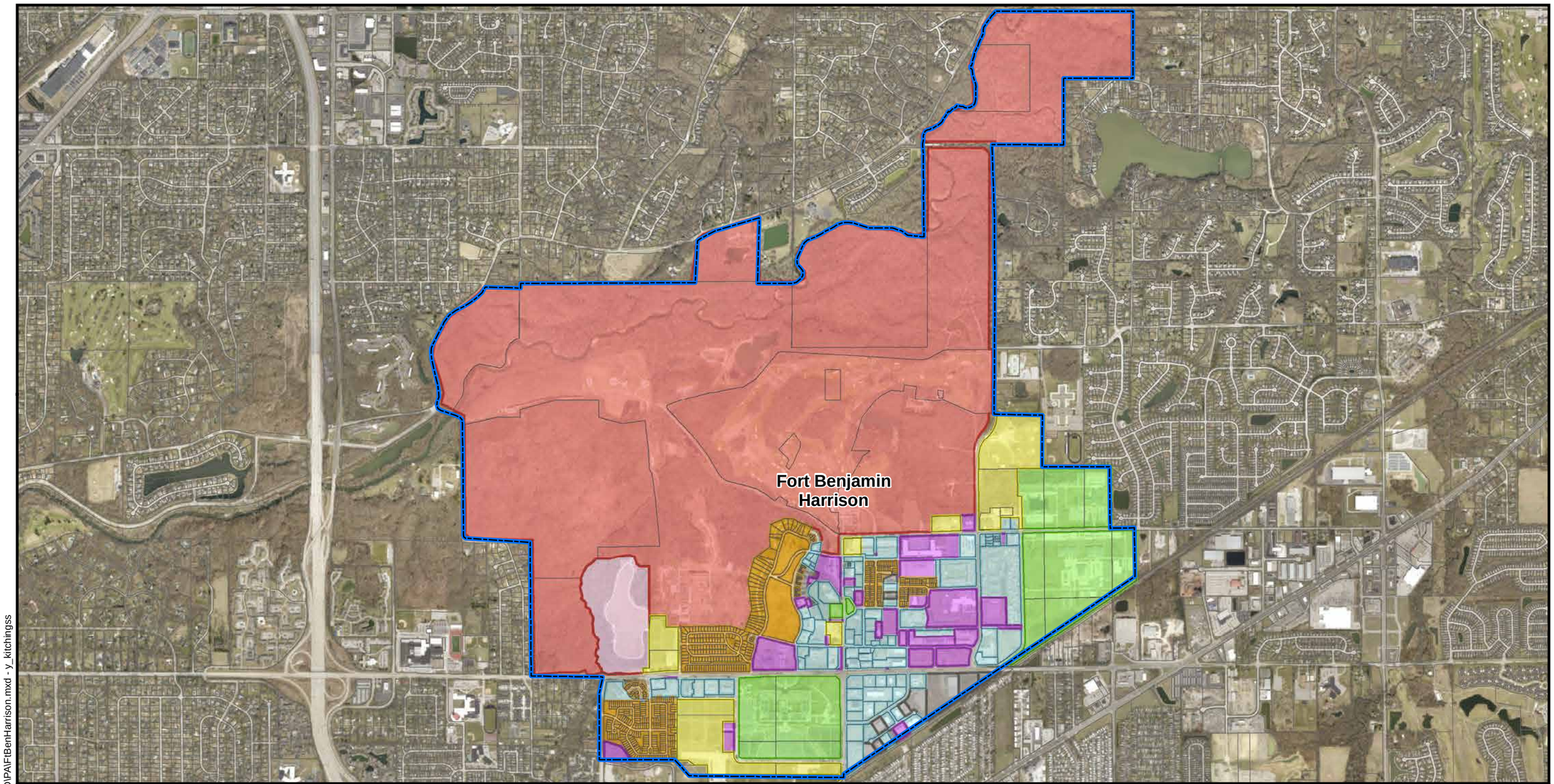
Site Features
Fort Benjamin Harrison
Lawrence Township, Indiana

FIGURE 2-1 | DATE: 5/23/2023



Parcel Ownership
- Industrial
- Commercial
- Exempt
- Residential
- City of Lawrence
- U.S. Government-Owned Property
- Indiana Department of Natural Resources (IDNR)
- Pending transfer to IDNR

- Parcel Boundary
- Installation Boundary

Sources:
Parcel Data compiled by IDHS from the counties of Indiana (https://gis.in.gov/ArcGIS/rest/services)
2021 Aerial Photography State of Indiana (https://xmaps.indy.gov/arcgis/services)
West Landfill is pending transfer to Indiana Department of Natural Resources.

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SCALE: 1" = 2,000'

IN STATE PLANE EAST (NAD83)
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US Army Corps of Engineers
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Parcel Transfer Map
Fort Benjamin Harrison
Lawrence Township, Indiana

FIGURE 2-2 | DATE: 5/23/2023

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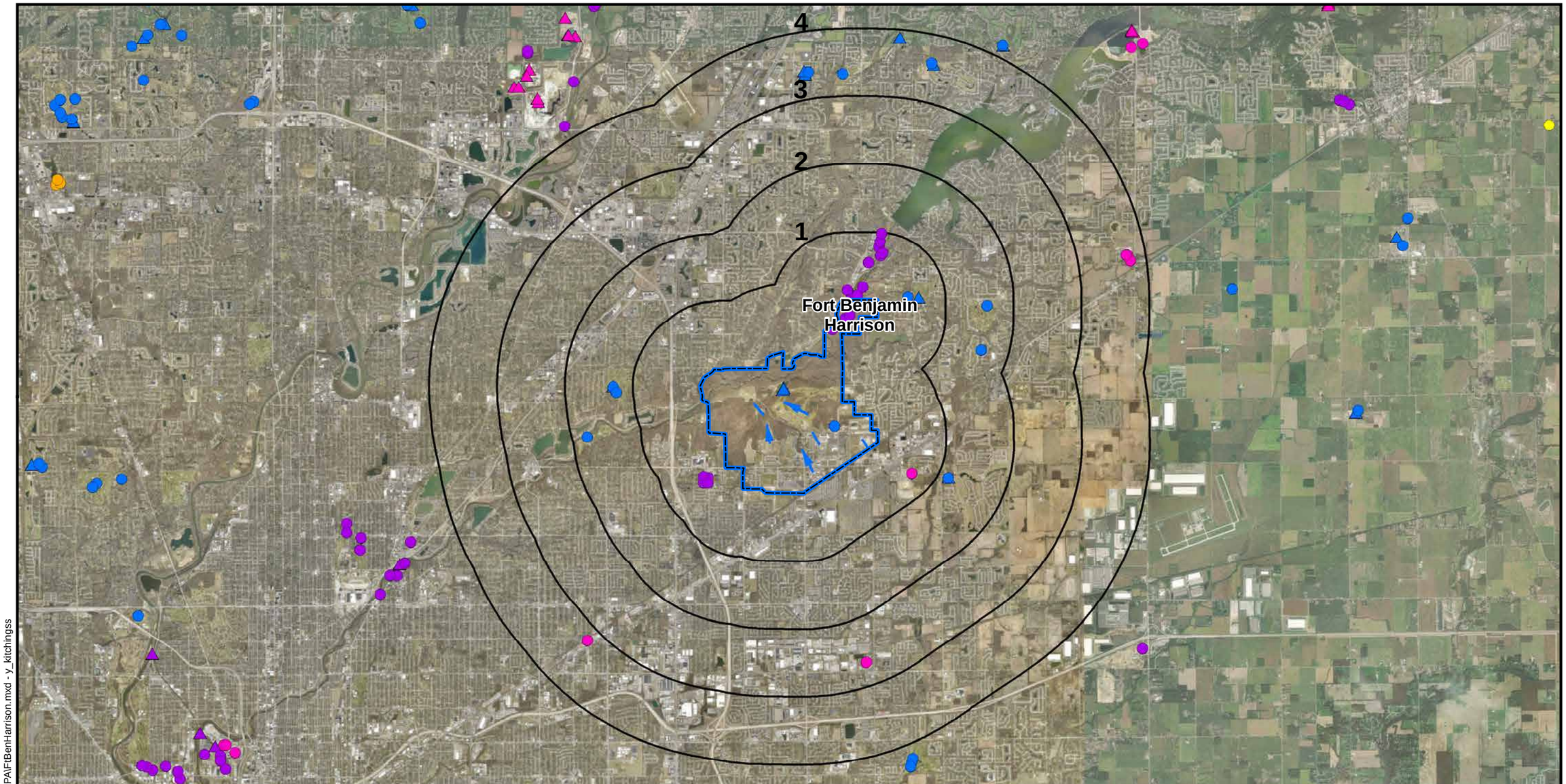

Groundwater Flow Direction
Installation Boundary

Groundwater Wells by Water Use

- Industry
- Irrigation
- Public Supply

Surface Water Intakes by Water Use

- Irrigation

Sources:
Groundwater Wells and Surface Water Intakes Indiana DNR (https://gis.in.gov/ArcGIS/rest/services)
2021 Aerial Photography State of Indiana (https://xmaps.indy.gov/arcgis/services)

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SCALE: 1" = 8,000'

IN STATE PLANE EAST (NAD83)

US Army Corps of Engineers
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Potable Wells Within a 4-Mile Radius
Fort Benjamin Harrison
Lawrence Township, Indiana

FIGURE 2-3 | DATE: 5/23/2023

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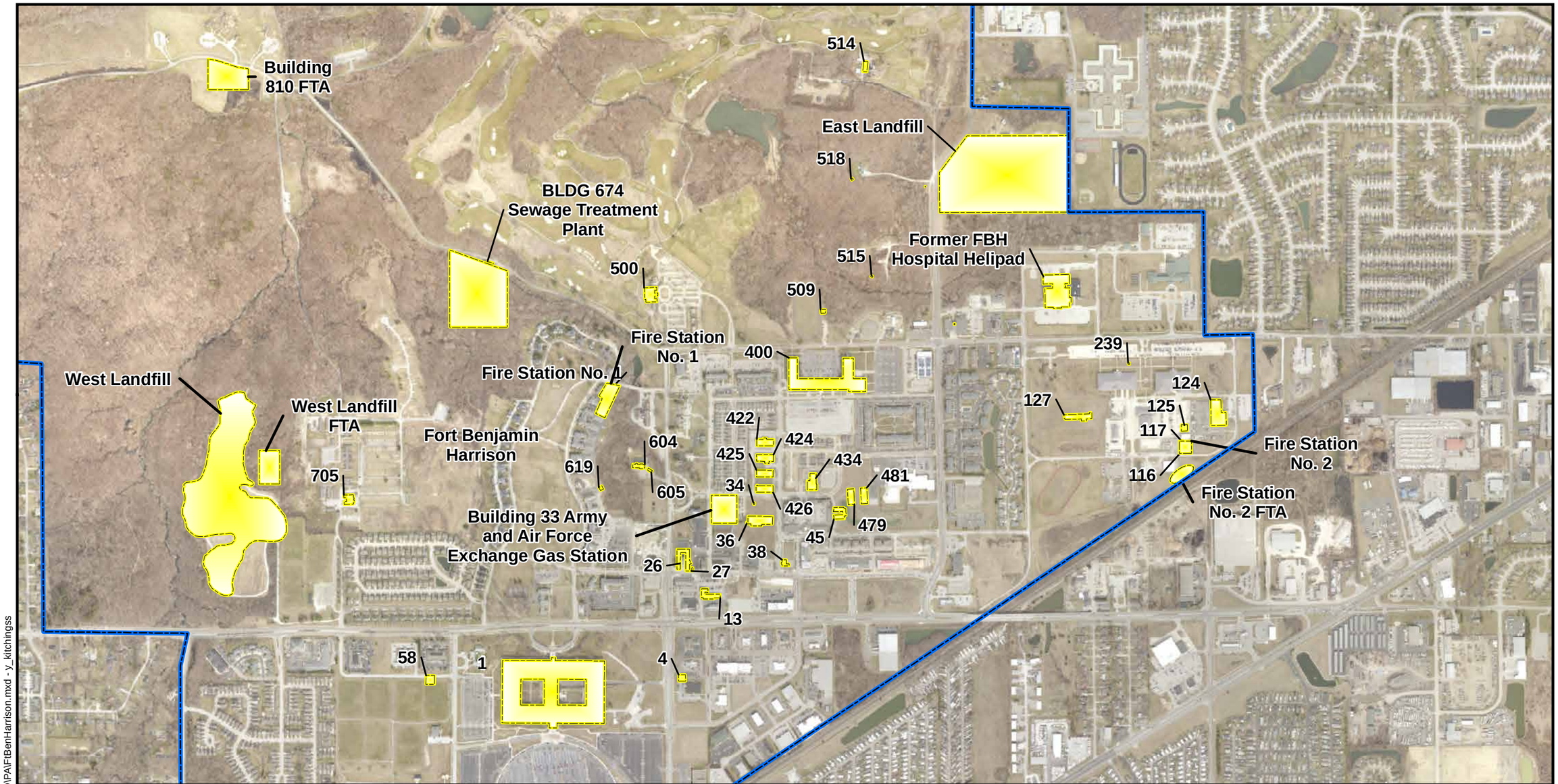

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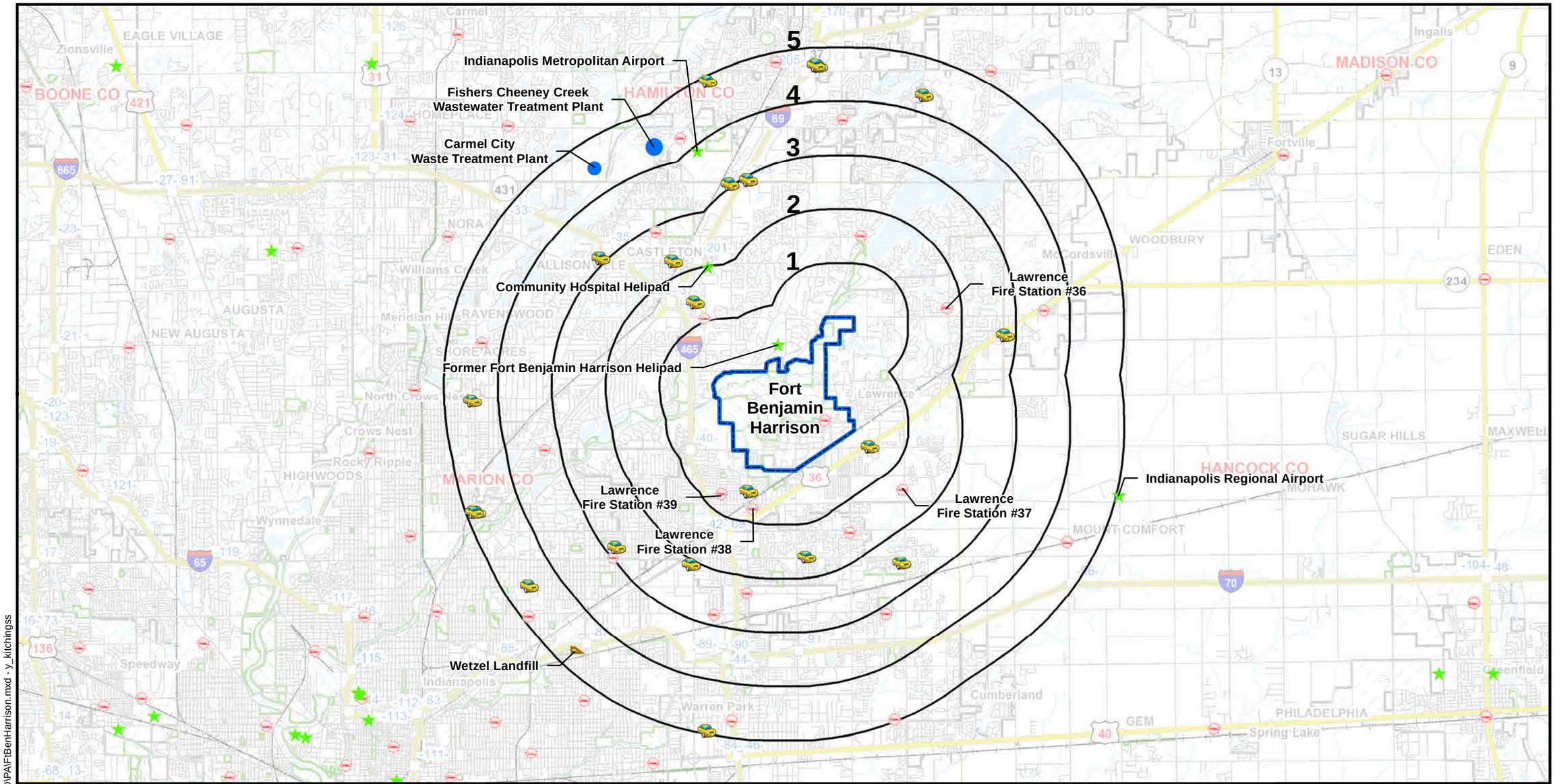

Car Wash (Google)
Airport/Helipads (FAA)
Fire Stations (IDHS)
Wastewater Treatment Plants (EPA)
Landfill Boundaries
Installation Boundary

Sources:
Airports and Helipads FAA (https://services6.arcgis.com/ssFJjBXIUyZDrSYZ/ArcGIS/rest/services)
Fire Stations IDHS (https://maps.indiana.edu/arcgis/rest/services)
Wastewater Treatment Plants EPA
(https://services1.arcgis.com/7EzQnrfw48ewO24q/ArcGIS/rest/services)
Landfill Boundaries Indiana DNR (https://gis.in.gov/ArcGIS/rest/services)
State Base Road Map INDOT (https://gis.in.gov/ArcGIS/rest/services)
Car wash facilities (Google 2023)

0 10,000 20,000
SCALE: 1" = 10,000'

IN STATE PLANE EAST (NAD83)

US Army Corps of Engineers
leidos

Potential PFAS Sources Within a 5-Mile Radius Fort Benjamin Harrison Lawrence Township, Indiana

FIGURE 4-2 | DATE: 5/23/2023

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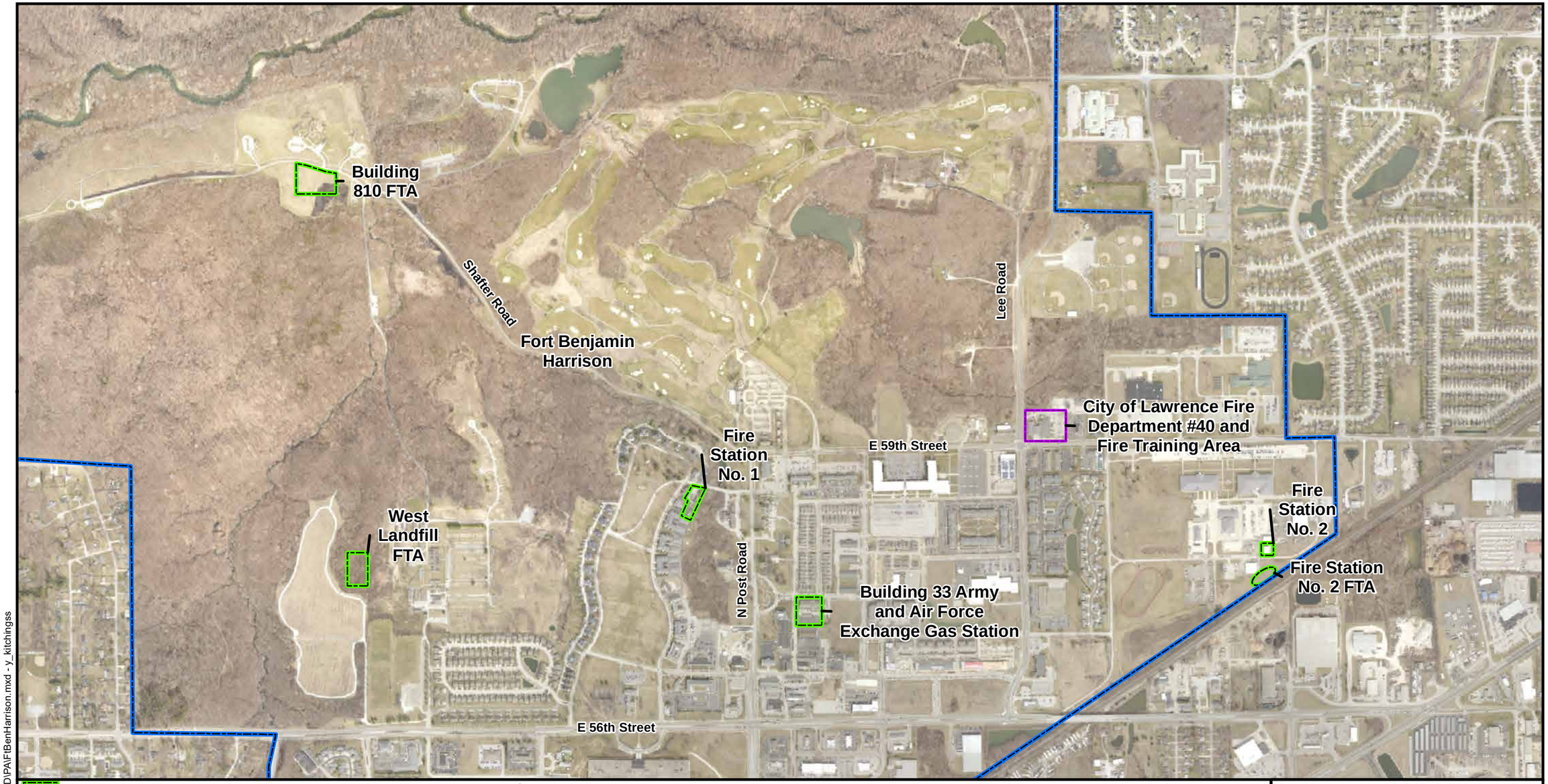

Area of Potential Interest – Pre BRAC Transfer Potential PFAS Use/Release Area
Post BRAC Transfer Potential PFAS Use/Release Area
Installation Boundary

Sources:
2021 Aerial Photography State of Indiana (https://xmaps.indy.gov/arcgis/services)

0 1,000 2,000
SCALE: 1" = 1,000'

IN STATE PLANE EAST (NAD83)

US Army Corps of Engineers

leidos

AOPI Map
Fort Benjamin Harrison
Lawrence Township, Indiana

FIGURE 5-1 | DATE: 5/23/2023

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